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RESEARCH INSTITUTE, NEW DELHI.

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EVERYDAY GARDENING IN INDIA

ELEVENTH EDITION
Revised and Enlarged



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EVERYDAY GARDENING IN INDIA

ADVICE ON PLANNING, PREPARATION AND
UPKEEP OF SMALL GARDENS
AND
SPECIAL HINTS ON THE CULTIVATION OF
FLOWERS AND VEGETABLES

By
E. W. GRINDAL



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D. B. TARAPOREVALA SONS AND CO., LTD.

"TREASURE HOUSE OF BOOKS"

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INTRODUCTION

IN RECOMMENDING Mr. Grindal's book on small gardens in India to all lovers of gardens I can write with my intimate knowledge of his skill as a practical gardener.

When the new Government House for Sind was begun the grounds had to be planned and a new garden started. The problem was not an easy one, for thirty acres had to be dealt with, with the minimum of expense, a very limited water supply and a brackish (*kalar*) soil. By a great stroke of good fortune for us and all future Governors of Sind, Mr. Grindal had just been appointed Comptroller of Sind and was posted to Karachi.

Having seen in Delhi the very beautiful garden which Mr. Grindal had made and which so often carried off the prize for the best garden and having admired his lovely exhibits of roses, sweet peas and pot plants in the Delhi Horticultural Society Flower Shows, I asked him if he would kindly help and advise me about the New Government House Garden.

He came over and we discussed the lay-out and from that morning in 1939 grew a very happy partnership which lasted until he was transferred from Karachi early in 1941. The garden was completed before he left and even his very critical eye was satisfied: a very difficult job, very successfully accomplished.

There is very little about flower growing, shrub-beries, soils, manures and all that concerns a garden, about which Mr. Grindal cannot give practical and tried advice. I wish his book every success.

OLIVE GRAHAM

GOVERNMENT HOUSE,
KARACHI.

Extract from the speech of H. E. the Governor of Sind on the occasion of laying the foundation stone of Government House, Karachi (Daily Gazette, Karachi, dated 3-11-39).

As the beauty of a picture is enhanced by its frame, so the beauty of this House is to be enhanced by the garden which is already being laid out about it. Much work already has been done in this connection and I wish particularly now to express to Mr. Grindal my thanks and the thanks not only of the future Governors of Sind, but also of all those residents of Karachi who will enjoy the beauties of this garden in the comparatively near future. We have, indeed, been fortunate in the posting of Mr. Grindal to Karachi, in whose person my wife and I have renewed our associations with one whom we knew in New Delhi as a gardener, combining unbounded enthusiasm with unfailing skill; and I am sure that those of you who at the conclusion of these proceedings visit the site of the garden will be able to bring before your minds a picture of what this garden of ours will be. And I am convinced that it will be a worthy setting for the House and an adornment to Karachi.

PREFACE

THERE are so many good and authoritative books on the subject of gardening that it has needed no small courage on my part to add to their number.

I have gardened happily and successfully on the plains in India for over 30 years and feel that if I record my experiences it may help other amateurs to avoid many of the mistakes I made and the difficulties I met.

In few directions have you a freer hand than in the making of a garden. Your creative instincts and energy are unfettered and by your own endeavours you can convert the original bare piece of ground into a place of beauty, while a garden already possessing many charms can be given added loveliness.

But there is another side to the picture. Considerable thought may be given to the garden, unlimited work put into it, and yet failure or at best only partial success may crown your efforts. Somehow the features are not quite right, the flowers half-hearted in their blooming, the lawn lacking in that velvety smoothness which is so desired, the hedges a little unkempt.

What is it that makes all the difference? Why is one garden a dream, another almost a nightmare?

It is because the art and craft of gardening is based on very sound rules; because the perfect garden does not just happen but is built up by the careful observance of those rules.

Order is Heaven's first law and an orderly garden is a piece of art that pleases the eye—it is poetry demonstrated.

The right way is no more trouble than the wrong ; often, indeed, it is far less trouble. But with the best will in the world that right way cannot be acquired by guesswork ; it must be gained from the experience of others. Thus your own knowledge is built up, a store of experience is gained, and henceforth you find the true enjoyment of gardening—that of knowing the how and why of everything that is done, in being a master of the chosen art and craft.

This little book is offered in a spirit of friendly guidance ; to put on the right road those whose experience is as yet limited ; to add to the store of knowledge of older hands at the game.

An attempt has been made to avoid the use of clumsy botanical terms. Common and vernacular names of trees and plants have been used whenever available and local and vernacular gardening terms, not found in a dictionary, have been explained as far as possible.

The botanical names of varieties of trees, shrubs, climbers, annuals, etc., used in the book can be traced easily into catalogues and price lists of reliable firms and nurseries, from which such fuller and technical information as is required can be derived.

In matters of detail the advice and suggestions principally concern gardening in the plains of India, but in all basic and fundamental matters the directions and instructions are applicable generally to gardening.

With the information in this little book to hand, therefore, I hope your gardening will be easier and more thorough and you will achieve that most satisfying of all possessions—the perfect garden.

E. W. GRINDAL.

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CHAPTER I—THE LAY-OUT

"GOD'S PEACE"

'Go find a road that runs out to the sky—
Away from the noise of the street.
Go find a hill where the big winds sweep by—
And green grasses blow at your feet.
Go seek a place where the kingfishers swoop—
Some haunt where the quiet waters gleam.
Go seek a bank where the willow trees stoop—
Over the brink of a stream.
In the green silences Life seems so good.
Here all your questionings cease.
For the hush at the heart of a bird-haunted wood—
Gives you a sense of God's peace."

PATIENCE STRONG.

AN ideal home is one in which the house and garden have been designed and constructed as integral parts of a whole.

Most people have their dreams of an ideal home but it is surprising how little time and forethought are devoted to the design of the garden as compared with that spent on the designing and furnishing of the house.

To-day, as never before, the value of fresh air and sunshine is realised and it is obvious that the best way to enjoy these is in one's own garden. The ideal design of a garden should be such as will permit of its being occupied and used to the utmost extent. As climatic conditions and inclement weather naturally compel one to spend an appreciable time under cover of a roof, it is necessary, if full advantage is to be taken of fresh air and sunshine, that the designing of the house and garden should be correlated, almost to the extent of bringing the garden into the house.

Both in the planning of a house and a garden it is the sun that one must primarily consider. The sun will not change his habits or his course and it is essential in designing both house and garden to observe his habits—his rising, his setting and his course across the

sky. Sunshine and fresh air are necessary, equally, to the existence of human beings and plants. The design of a house and garden should be such as to catch as much sunshine and fresh air as possible.

Just as a dark, cold room is repulsive to human beings, so is a dark, over-shaded garden repulsive to plants.

Again, as in the case of human beings, it is the early morning sun that is the most beneficial to plant life, warming as it does the soil and causing early activity in the day's growth.

Ideal planting is generally that which is open to the sky and has a southern or eastern aspect. Equally as this aspect suits plant life it suits human beings. It is best that the portion of the house which is occupied for the greater part of the day should have an eastern or, preferably, a southern aspect. An ideal arrangement is to have the main living rooms with wide windows (where necessary, as in the plains, protected by a deep verandah) with a southern aspect, to which can be linked the flower garden with its restfulness and beauty.

It is impossible to frame any hard and fast rules for the lay-out of gardens, nor will it be of much use to reproduce diagrams as they cannot be of general application.

The most fascinating and probably the easiest way to plan a garden is to set to work very much on the same lines as one would in planning or designing a house. It is a fact, perhaps not generally appreciated, that the plan of a house and of a garden have much in common.

The exterior or containing walls of the house repeat themselves in the enclosing wall or fence of the compound.

The Hall has its replica in that portion of the garden that adjoins the approach to the house.

The Drawing or Living Room has its parallel

in the main and what should be the most beautiful and useful portion of the garden.

Corresponding to the Dining Room, there should, if possible, be set aside a sheltered portion of the garden in which it is possible to have breakfast and tea and even, occasionally, lunch and dinner.

The Kitchen and Service Rooms find a replica in the kitchen or vegetable garden, which should include provision for growing cut-flowers.

The Nursery and Office Rooms find a similarity in that portion of the garden which must be set aside for seed sowing, propagation, transplanting and general "messy" work. Its very purpose demands that it must be shut off from the rest of the garden.

"My Lady's Boudoir" should, if space permits, be repeated in the garden. A small area, with a more or less secret approach, may be enclosed with shrubs and laid out with a few beautiful flowers, where the lady of the house can retire and rest or entertain her special friends, as she does in her boudoir.

It is perhaps not irrelevant also to bring a rosary or rose garden within the category of a Bedroom or Boudoir. The rose plant is decidedly seasonal and there are times when its appearance is far from pleasing. It is, therefore, best, if possible, to isolate the rose garden and fit it in where it will not be too conspicuous.

Last, but not least, provision should be made for drying clothes-lines to be erected where they cannot mar the view of the principal garden! If no other area is available, the kitchen garden or the "work room" may be made to serve this purpose.

Accepting the parallel treatment described above, one can now get down to piecemeal consideration of the planning of a garden.

The area of ground to be occupied by the garden generally is outlined by hard and severe compound walls or fences. These walls or fences are perforce

aligned to fit in with the public roads and services and adjoining building areas. They do not provide privacy and seldom fit in happily with the design of the garden. It is, therefore, often necessary to have an inner enclosing boundary for the garden, and this is best provided by the judicious use of shrubberies and hedges. The former are more natural in appearance and more beautiful than hedges for outlining the floral garden and should be used wherever space permits. Hedges, on the other hand, are useful and more serviceable for enclosing the vegetable garden, "work room," etc., and, of course, hedges must be used where formal effect is sought. Proceed warily in deciding to have hedges because of the labour entailed in keeping them clipped and trimmed.

The next section to tackle is the approach to the house or "Hall" of the garden. The alignment of the approach roadway must depend on the mode of access from the public road. The local Council generally have rigid instructions as to the front elevation of a house and its distance from the public roadway. The decision as to whether there should be one or two entrance gateways and the alignment of the approach road will depend on the local Councils' regulations and on the area of land available. It is essential, however, if the approach road is intended to admit cars and other conveyances, that adequate provision should be made for their easy arrival and departure. If there is only one gateway, the best treatment is to have a circular roadway in front of the porch or main entrance where passengers alight. The approach road should lead into this circle and the road to the garage should take off from it. The circular road should be of sufficient diameter to allow a fairly large car to use it comfortably. The straight portion of the approach should preferably be at right angles or parallel to the walls of the house.

The lay-out of the area of garden surrounding the approach road must obviously depend on the alignment of the latter. It should be remembered, however,

that this is what may be termed the public portion of the garden and its treatment should be such as to secure lasting and permanent effect.

It is frequently the practice to make the principal flower garden on the approach side of the house and to neglect the rest of the garden. As this portion of the compound is generally open to public view and can seldom be utilized for sitting out, etc., it is a mistake to do too much here, even as it would be a mistake to over-treat the Hall in a house.

The most satisfactory arrangement is to confine the planting of the area of flowering trees, shrubs and lawns. Here should be no flower beds, which are untidy and bare for considerable periods of the year, or plants, such as roses, which give only seasonal effect. It may not be a bad idea to design the circular area bounded by the approach road with a formal rock garden or water pool. Either will present a pleasing and restful appearance. What should be sought is dignity and simplicity.

Having decided on the treatment of the approach to the house, one should turn to the principal garden or centre piece of the scheme, corresponding to the Drawing or Living Room of the house.

In order to derive the greatest benefit from this garden, it is necessary to design it with due regard to the living rooms and verandahs of the house. As far as this is practicable, the garden should be brought right up to the house. A paved area or terrace along the house will increase the attractiveness of both house and garden, linking the two together. Straight paths should be parallel to or at right angles to the lines of the house. Any other arrangement will produce a lop-sided and unsatisfactory effect. The centre or focal point of the garden should be fixed with due regard to regular geometrical designs (squares, rectangles or circles), a circular scheme giving the most pleasing result.

Just as it is considered bad taste to overcrowd a

drawing or living room with ornate furniture and pictures, so it is bad taste and unsatisfactory to overcrowd the garden with too many plants and flowers. Beyond perhaps for the central feature, it is unsatisfactory to work on formal lines, which generally present hard effects.

If circumstances permit, it is pleasing to have a small water tank of appropriate shape as the centre or focal feature of the lay-out of the garden.

The principal general feature of the garden should be lawns. The more wide and unbroken the lawns, the more beautiful and restful the effect. A beautiful lawn well may be compared to a beautiful carpet, without which any scheme of furnishing is ruined.

This portion of the garden should be enclosed and rendered private by boldly conceived shrubberies. Along the inner line of these can be placed large beds that can be planted with cannas, sweet peas or mixed borders of annuals in season.

In determining the location of beds of flowers it should be borne in mind that plant life generally will not thrive in the shade and that nothing will do well if planted too near the north of any shade-casting object, be it a wall, a shrubbery or even a hedge. A few formal beds of annual flowers look attractive laid out around a central feature of tank or sundial.

Here and there, on the lawns, can be placed clumps of selected flowering shrubs, which may be interspersed with a few dwarf flowering trees. This will avoid flatness and will provide the necessary shade. Remember that over-shading restricts other branches of gardening and is apt to produce a gloomy and sombre effect in the cold weather.

In selecting the sites for flower borders, for clumps of shrubs and for flowering trees be guided by views that can be obtained from the house.

The house should form the pivot of the garden plan. There should be pleasant views from the doors and windows and each view should terminate in a

definite object—perhaps a large specimen tree, a clump of selected shrubs, a sundial, or a bench on which the eye will focus with pleasure.

There is always a feeling to introduce some decorations into the garden in the way of pergolas, arches, pillars, bird baths, etc., but it is desirable to restrict such features to an absolute minimum. They are expensive and if put in the wrong place are distressing and tend to impair the lay-out.

If the principal garden is not conveniently situated with regard to service from the Kitchen and Pantry, a special corner of the garden may be laid out in the vicinity of the Dining Room in which it will be convenient to have meals. The area should be sufficiently private and should have a couple of evergreen shade trees, and there should, of course, be a lawn. There is no need for flower beds or similar elaborate treatment. The "summer house," if one can be afforded, should be located in this garden.

If space permits, "My Lady's Garden" and the Rose garden should next be fitted into the plan. It is not necessary that these gardens should adjoin the building and they can be placed in any convenient areas provided suitable access to them is available. The Rose garden will need protection from the north and west winds but there should be no shade from overhanging trees. A certain amount of shade will be welcome in "My Lady's Garden" and this can be provided by one or two evergreen flowering trees. This area can be treated informally or it can be laid out formally as a sunk garden. Alternately, a rockery can be worked into the scheme, with excellent results. If pale yellow and white flowered shrubs, creepers or annuals, interspersed with some sweetly scented plants, are planted in this little garden, it will enhance its value especially for warm evenings and moonlight nights.

The vegetable garden will need an area of not less than 2,000 square feet and should preferably be

rectangular in shape. Vegetables need sun and the garden should be located as far from trees as possible, the root action and shade of which retard both vegetables and flowers. The vegetable plot should be fenced and provided with a hedge to protect the crops from hot and cold winds.

Even if space and conditions do not permit one to set aside portions of the garden for the "Rosary" and "Boudoir," it is essential that ground be reserved for the "work" garden. This will consist of manure pits or heaps, nursery beds, seed beds, potting ground (with shed if possible), etc., and may be fitted into an odd corner as far from the house as possible. It is necessary that water should be conveniently handy as this is needed for preparation of manure and for watering the nursery beds, etc. The area should be shut off from the rest of the garden by a shrubbery or hedge. It may be found convenient to tuck it in behind the shrubbery outlining the main flower garden, which will then serve a dual purpose.

A small plot should be set aside for growing cut flowers for house decoration purposes near either the vegetable garden or the "work" garden. The area should be free from shade of trees and their root action.

If the compound is large enough, it is not unusual to try to fit in a tennis court. Even a lawn tennis court mars a garden and it is necessary that the position of the tennis court should be such as to intrude as little as possible on the garden. Its existence should be hidden by creepers, shrubs or hedges, the outer line of which should fit in with the design of the garden. If drainage arrangements can be made, it is not a bad idea to have the tennis court at a lower level than the rest of the garden, as the wire screens, etc., are then less conspicuous.

Having now considered all the essentials and decided what features one can and should fit into the garden, a plan of the site may be prepared on which should be shown the house, compound wall, garage,

outhouses and any existing trees and other permanent features which it is desired to retain. Peculiarities of site in the way of banks or sloping land must be taken into account and worked into the design.

The scale of the plan and the four points of the compass should be correctly marked. The latter influence the planning to a considerable extent, as already explained.

One can now proceed with pencil, foot-rule and a pair of compasses to complete the plan. For those not familiar with drawing and planning, the easiest course is to work on sectionally dimensioned paper. Proportions that look well on paper will generally look well in the garden.

First, fit in the essential roads (entrance, departure and garage), then fix the focal points of the principal garden areas, *i.e.*, the approach and main gardens. Now decide into what sections the garden can be divided and proceed to plot in the paths, trees, shrubberies and hedges. This should provide most interesting occupation and a little trial will show that it is not nearly as difficult as may appear in the first instance.

Paths play an important part in the lay-out of a garden and each should serve a definite purpose. If a complete tour round the garden can be provided its interest will be enhanced but where this is not possible owing to limited space, a straight walk, flanked by shrubberies or flower borders, will seem to increase the length of the garden, especially if the path is narrower at the far end.

Winding paths can be very attractive, particularly when the curves are planted with shrubs and tall growing subjects so that the view beyond is hidden. This introduces an element of surprise but the curves must be graceful and serve a definite purpose. A path which turns and twists for no apparent purpose irritates.—so does a path that is too narrow. As a general rule main paths should be wide enough for two people to walk abreast comfortably.

Study the chapters on trees and shrubberies and be careful to allow adequate space and distances for these features. Trees and shrubs with strongly coloured flowers in red or orange should be massed together at a distance from the house—softer shades should be kept nearer. In deciding on the location of flower beds, remember to avoid shade and north shadows. As previously advised, work only on simple geometrical designs and be careful to keep the alignment of straight paths, hedges, etc., either parallel with or at right angles to the lines of the house. As far as practicable, place the principal flower beds and other features where they can be seen directly through the exterior doors and windows of the living rooms.

CHAPTER II—ORNAMENTAL AND SHADE TREES

Within their cool and friendly shade

We may find peace and rest—

And look into a quite green place where birds make melody.

This is God's greatest gift to man—the glory of a tree.

PATIENCE STRONG.

TREES must find a place in every garden and no garden, however small, is worthy of the name if trees are entirely absent. It is on the selection of the species and their proper placing that failure or success in other branches of horticulture depends.

When planting gardens, ornamental shade and flowering trees need careful selection with due regard to the height and spread they will ultimately attain, it being kept in mind that, though a certain amount of shade is necessary, over-shading restricts other branches of horticulture and is apt to produce a gloomy and sombre cold-weather effect, owing to the impossibility of introducing sufficient colour into the general scheme.

Another point to be remembered, which is of considerable importance to those whose work keeps them on the plains the year round, is that although during the dry, hot weather a fair amount of shade is welcome during the daytime, too many spreading trees restrict

surface evaporation after sunset and prevent that drop in temperature, so noticeable and appreciable, which takes place over an open, green grass surface.

In a small garden comparatively few trees are required, but as a rule the planting of trees is overdone and before the species planted have reached their full development the necessity of the removal of some arises because of the impossibility of other forms of culture under their dense shade.

The defects caused by an excess of shade are, (1) its adverse effect on the great majority of flowering annuals, there being but few species which produce colour under such conditions, (2) the failure of *doob* turf under the trees, and (3) the strangling effect of tree roots and shade combined on lesser growth such as ornamental shrubs and other garden plants.

With large gardens there is less difficulty, it being possible to keep an open area for floral effects and at the same time introduce a number of trees of various types without restricting efforts in other directions. It is in small gardens that the disadvantages of shade are most noticeable and to overcome this the owner must use all possible discrimination in the selection of species and their placing. The temptation to plant quick-growing trees for early results must be resisted.

The defect caused by the failure of *doob* grass under trees can be obviated by the cultivation of the annual winter grass, *poa annua*, and the small yellow-flowered *exalis* which invariably puts in an appearance in the shade of trees if the soil is kept reasonably moist. This in many instances is not the case, as the roots of many trees slightly raise the surface soil, with the result that irrigation drains away instead of penetrating to a useful depth. The remedy is slightly to reduce the surface level under the trees, then *cheel* (scrape) off a fine film of soil from areas where winter grass is known to have seeded and spread it over the shaded portion. This hastens the effect required, but the growth will invariably introduce itself without artificial aid if

sufficient moisture is present to support it.

On turf playing surfaces shade is disastrous, as there is no substitute for *doob* grass in this case. Large shade trees should, therefore, never be planted on the east or south sides of grass tennis courts or the turf will rapidly deteriorate with the setting in of winter, even two or three hours of early morning shade being sufficient to cause a marked difference. Even if planted on the west side, although the turf itself will not be affected, the dappled afternoon shade is dazzling to the eye and interferes with play.

Shade falling on flower borders limits planting to the very few species that succeed under such conditions and the results are much the same in the case of flowering shrubs, although here shade-loving species are more numerous than among flowering annuals.

It is obvious, therefore, that indiscriminate tree planting, when trees are placed without due regard to their future development and the general lay-out, may have the effect of wrecking an otherwise promising garden scheme and necessitate the ultimate removal of handsome tree specimens which have taken years to develop—a most distressing and heart-breaking state of affairs.

It may be used as a reasonable guide that the space between trees should be about equal to their height. Thus small growing trees such as the *Cassias* and *Bauhinias* should be planted about 20 feet apart.

The best time for planting trees is between February and April but because of the increasing heat they should be in the ground by the 15th of March, if possible, as they then have time partly to establish themselves before having to contend with the fiery dry heat of May and June.

When planting, adequate and thorough soil preparation is necessary for quick and satisfactory results. A young tree will not thrive and make quick progress if planted in a hard soil cultivated only to a depth of

a foot or so. Here and there success may come, if by chance a site has been selected on which deep earth filling has been done, but in the majority of cases the results will be weak, stunted growth and a miserable specimen even at the end of 10 years.

Holes four feet square by four feet deep should be excavated and a proportion of $\frac{1}{3}$ good, well-rotted stable manure or compost manure added to the soil before refilling.

If the existing soil is alkaline or for any other reason unsuitable, it should be replaced by fresh, sweet soil imported from elsewhere.

The mixture should then be well watered to bring about consolidation and the tree planted as soon as the soil is sufficiently dry to be workable. For this purpose a hole should be prepared large enough to take the root of the young tree. If the plant is obtained locally, it should have a clod of earth large enough to prevent damage to the tap root and main side roots when transplanting. When the tree is planted, the tap root should be upright in the hole and the collar kept just clear of the top of the pit.

To permit adequate irrigation especially in dry climates the surface soil should be left about eight inches below surrounding levels.

The cost of the work can be calculated by applying the local rates to the following quantities :—

Per tree.	Planting in good soil.	Per tree.	Planting in bad soil.
1. Excavation & filling (4' × 4' × 4') ..	64 c. ft.	1. Excavation & Removal (4' × 4' × 4')	64 c. ft.
2. Stable or compost ma- nure (12")	16 c. ft.	2. Sweet earth	56 c. ft.
3. Cost of tree.		3. Stable or compost ma- nure (12")	16 c. ft.
		4. Cost of tree.	

Where possible, the trees should be irrigated by flow and the depressions filled to the brim, but where

this cannot be done and watering is carried out by hand, it should be seen that the *mali* or *bhisti* does not limit his activities to purely surface watering, as he most certainly will do if not supervised. When watering, water copiously, giving sufficient to penetrate to the full depth of the prepared soil. To ensure that water does penetrate to the roots, it is not a bad idea to insert vertically an earthenware pipe about 4 inches in diameter and 18 inches long, in the prepared tree hole and to pour the water into this. Alternately, one corner of the hole can be filled with small stones or large ballast through which the water will easily percolate.

During the hot, dry weather a surface mulching of coarse leaf mould or compost manure 4 inches deep will reduce the quantity of water required and maintain a more equable supply of moisture at the roots.

Young trees should be staked in order to develop a straight trunk and to prevent damage by wind. Raffia or split plantain fibre should be used as binding material and a small pad of hessian or cloth should be placed between the binding and the bark.

Young trees, at least for the first year of their growth, should also be given light shade and protection from hot winds. This can be provided economically by cheap matting or grass screens fixed to stakes.

Young trees will thrive better with deep copious waterings once a week than with a light surface sprinkling every second day which only penetrates a few inches, leaving the roots dry and keeping the plants in a dormant, semi-starved condition, if they contrive to survive at all. Slow weak growth is often caused by purely superficial waterings, which, penetrating only to a very limited depth, keep the roots of the trees near the surface where they are subjected to alternate wet and dry conditions, a state very adverse to healthy growth. As the trees develop, watering may be done at longer intervals. In between waterings, the surface soil should be regularly cultivated and turned.

Not only will this reduce the quantity of water required but it will aid the growth considerably.

During growth and when established, trees will need a certain amount of pruning. Lower branches that are likely to be too near the ground should be removed and light inter-lacing useless branchlets should be cut out from time to time.

For moisture loving trees, such as *Poinciana*, *Lagerstroemia flos reginae*, *Cassia javanica*, *Cassia nodosa*, *Polyalthia* and *Sterculia*, once they have attained a fair size and the roots have extended beyond the original holes, it is advisable to reduce slightly the level of the lawn surface above their roots. This facilitates irrigation, gives the trees the full benefit of rainfall and prevents the drying and dropping of flower buds which sometimes takes place in a dry season when only shallow irrigation is possible. Such shallow depressions in the lawn surface are not unsightly if their margins are carefully graduated to surrounding levels and not made too abrupt.

Before making a final selection of trees, it is necessary to consult the local gardens, or otherwise discover by personal investigation what varieties thrive best in the locality. Some varieties do better in some places than in others and it is always best to confine one's choice to those that have succeeded after trial.

When selecting young trees from stock, refuse any plants which have been kept in small pots for 3 or 4 years. Such plants will have become starved and root bound and are slow in resuming activity after transplanting.

Garden owners who have not had the advantage of carrying out the initial work of laying out and planting their garden will often find a number of isolated plants such as young trees, creepers, etc., which have reached a certain stage of development and then lapsed into a sickly dormant state from which the closest attention to irrigation and culture fails to move

them. This, in almost all cases, is due to inadequate soil preparation before planting and is the result of restricted root action through the presence of masonry rubble or other hard substances, which confines the roots to a small area and cuts off the supply of moisture from the subsoil. This unsatisfactory state of things may be remedied by digging a trench 3 feet deep by 2 feet wide round the plant at a distance of from 3 to 6 feet from the base, according to its size. After the trench is opened, the earth and obstructing material should be carefully teased out from among the roots by the use of a hand-fork, care being taken that the feeding roots are not unduly damaged in the process. When about 18 inches of the outer roots have been exposed, fill in the trench with good soil taking care the rootlets are evenly distributed and not massed together. The soil should be carefully and firmly trodden down as filling proceeds, and as soon as this operation is complete the plant should be well and deeply watered.

This treatment, carefully carried out, cannot fail to have the desired result and is quicker in effect than replanting and awaiting development from the immature stage. The best time for carrying out this work is at the commencement of the rains, when atmospheric humidity is high and leaf surface evaporation at a minimum, or during the cold weather when the plant is at rest. On no account should it be attempted during the hot, dry weather when hot winds are blowing. If the nature of the plant permits hard pruning, this should first be done and the stems well wrapped up with grass mats or gunny which should be thoroughly damped with the syringe at early morning and late evening. As soon as growth has recommenced the covering should be gradually dispensed with and towards the last only used for shading during the hottest hours of the day.

The following are fairly comprehensive lists of choice and quick growing specimens which will provide ample scope even for an extensive planting scheme. The varieties marked with an asterisk particularly

are recommended for gardens where scope is limited.

I. FOR SMALL GARDENS, in which safety lies in keeping to species of limited height and spread, the following trees are generally suitable:—

Acacia auriculaeformis.—A dwarf ornamental evergreen tree which bears delicate yellow flowers. The foliage is similar to that of the Eucalyptus tree but the formation of the tree is more compact. Suitable for a lawn or for a deep shrubbery. Pruning of the branches helps to form a better-shaped tree which is less likely to be broken in high winds.

There is another variety, *moniliformis*, which is very similar but has more delicate foliage.

Averrhoa carambola (The Kamrak), is a medium-sized evergreen tree of a height of about 40 feet and a spread of 30 feet. Its fruits are made up into various preserves, but its chief attraction is its pretty, light, symmetrical habit of growth, which makes it deserving of more general use in the ornamental garden. Its foliage is light and graceful and of varying tints of pale green and yellow. It is an ideal tree for isolated positions on lawns or for tall backgrounds, and is also most effective as an avenue for drives. Its varying foliage tints make it extremely effective in backgrounds, particularly if planted in conjunction with trees of a heavy type of foliage.

Bauhinia variegata (Kachnar).—A medium-sized deciduous tree with dark brown, nearly smooth bark. The leaves commence falling in November to December and the tree is nearly leafless by March. Flowers, borne from February to April, are large fragrant white, pink or mauve (three varieties), splashed with darker veins. Moisture loving.

Bauhinia Triandra (The Geranium Tree—Koiral).—A medium-sized evergreen tree, with ashy grey or brown, nearly smooth bark. Flowers usually rosy purple, large and showy. Flowers continue throughout September to November. Starts flowering at an early age. Moderately drought resisting.

Bauhinia purpurea, is another variety of this tree and bears red flowers.

Cocsalpinia cororaria (Divi Divi or Libi Dibi). — medium-sized tree; habit round and spreading. Foliage feathery and graceful. Bears insignificant pale yellow flowers in the hot weather. *Almost evergreen.*

**Cassia fistula* (The Amaltas or Indian Laburnum). — This is one of the most graceful and ornamental trees for small gardens. It is thoroughly at home in tropical climates and will flourish provided there is a fair depth of soil, even if no form of irrigation exists. It is leafless for a very short time, or hardly at all, between March and May, new leaves appearing in April to May. These are bright green or sometimes a beautiful rich copper colour. The long pendulous racemes of large bright yellow flowers appear chiefly with the new leaves. There are two distinct varieties — one has large leaflets and bright yellow flowers; the other variety has smaller leaflets and pale yellow flowers. The latter is, if anything, the more beautiful of the two trees. Few trees in India are more beautiful when in flower. Draped in streaming clusters of bright yellow blossoms which hang from its branches in a golden shower, the tree suggests the English Laburnum but it is infinitely more beautiful. It possesses the additional advantage of being drought-resistant and is not browsed by cattle. It is, therefore, an ideal tree for non-irrigated backgrounds and plant screens. One can imagine nothing more striking and arresting to the eye than *Cassia fistula*, *Poinciana regia* and *Peltophorum ferrugineum* flowering side by side, the bright scarlet, gold and yellow flowers intermingling beautifully. The tree is propagated from seeds which germinate tardily. The seeds should be sown in March or April and regularly watered. Transplanting requires some care but it can be carried out satisfactorily while the plants are still comparatively small. Height 20 to 30 feet.

Cassia grandis (Horse Cassia). A small tree with

* These trees particularly are recommended for gardens with limited scope

deep green foliage. Flowers are rose coloured and grow in the axils of the trees in drooping racemes. The Horse Cassia flowers in February and March when it has lost its foliage. It is the earliest flowering Cassia and commences the cycle of flowering Cassias. *Deciduous*.

**Cassia javanica*.—This has been described as the most beautiful Cassia. It is a medium-sized tree. Its straight trunk covered with smooth dark brown bark supports a spreading crown of sturdy horizontal branches and numerous drooping feathery-leaved branchlets. Leaf fall commences in December, some of the leaves turning a bright yellow. By February most of the branches are bare—their only ornament is the blackened seed pods. The soft tender green leaves come out in May, together with clusters of deep pink buds. The buds are grouped in whorls at the end of short, lateral branchlets. These presently opening, form lovely bunches of rose-pink flowers. In its crown of tender green flowers and flower-laden branches the Java Cassia is indescribably beautiful. The distinct clusters of flowers intermingled with the foliage is a character which distinguishes the flowering of this Cassia from the Burmese Pink Cassia. In the latter the flowering branches are leafless. It can be distinguished from *Nodosa* as described against that variety. By mid-June, the height of the flower season is past and the ground below the tree is strewn with fallen petals. The tree requires a sheltered situation as its wood is weak and if planted in an exposed place it is liable to be badly damaged by strong winds. It is of quick growth if soil moisture is present in sufficient quantity as it is a moisture loving tree. The tree is propagated by seeds which should be sown at the beginning of the rainy season.

**Cassia marginata* (The Red Cassia).—A rather small, round shaped tree growing about 15 to 20 feet in height with slender downward curving branches. It is a native of Ceylon. Less robust than the other

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Cassias, the Red Cassia is uncommonly beautiful at all times and particularly when in full flower. The petals of the flowers are terra-cotta red, with fine green veins deeper in tone under the surface. There is a great profusion of them covering the upper surface of the drooping branches. The older blooms are very bright pink. Flowers in May and June. Propagated by seed which should be sown before the rainy season.

Cassia multijuga.—This is a small South American Cassia, recently introduced into Western India. The leaflets are bright green above and very pale, almost white, below. The tree bears masses of bright yellow flowers during August and September when it is in full leaf. It is the latest flowering Cassia. *Evergreen*.

**Cassia nodosa*.—This tree is very similar in general habit to *Cassia javanica*. It grows to a larger size than the Java Cassia. Like the latter, it has a crown of spreading branches with numerous drooping feathery-leaved branchlets. The leaf, which is from 6 inches to a foot in length, is composed of from 6 to 14 pairs of leaflets without an odd terminal leaflet. The base of the leaflet is oval but towards the apex it narrows and becomes almost lance-shaped. The leaflets of the Java Cassia are blunt or rounded at the tips. The leaflets of the *Cassia nodosa* are smooth and leathery in texture with a glossy upper surface, while those of the Java Cassia are glossless and slightly downy below. The flowers and buds are of a bright pink colour and are set in whorls at the end of a short branchlet. The flowers have 10 very unequal stamens. The lower three are the longest, each with a distinctive globular swelling in the middle. *Cassia nodosa* is also a moisture loving tree and can only be grown where the water supply is ample and frequent. It also requires a sheltered situation as its heavy wind-resisting foliage renders it liable to severe damage from strong

*These trees particularly are recommended for gardens with limited scope

winds. It is propagated by seeds which should be sown just before the rains, as in the case of the other *Cassias*.

**Cassia renigera* (The Burmese Pink Cassia).—A small, *deciduous* tree, growing to a height of 18 to 20 feet. The tree has a short trunk and a few upright branches which bear numerous slender drooping branchlets clothed in feathery leaves reaching downwards like spreading plumes. The main flowering season is from May to July when the branches are smothered in a gorgeous profusion of pink and white blooms, the branches being leafless. The racemes of flowers grow from scars of fallen leaves.

Celtis australis (Kar).—*Deciduous*; height 40 feet; a splendid shapely tree with arms open and the branchlets pendulous. The *Celtis* is beautiful in full leafage, when golden tinted in late autumn, or even when quite leafless. A splendid fast-growing tree.

Cordia sebestena (The Scarlet Cordia or Aloe-wood).—India is the home of quite a few *Cordias*. *Cordia sebestena*, the most showy of the lot, is a foreign variety imported from Cuba. It is a dwarf *evergreen* tree growing generally to a height of 15 to 20 feet. It bears large oval-formed leaves coarsely wrinkled and so rough as to be disagreeable to the touch. The gorgeous looking flowers, which are produced almost throughout the year in dense heads at the ends of the shoots, are orange-scarlet. Flowers are sessile and have funnel-shaped corolla. Unlike most tree blooms, the flowers last a long time in vases. The fruit is a pure white drupe, the seeds of which very soon lose their power of germination. The stem is short and crooked. The tree is quick growing; stands wind, salt spray and sandy soil, and is *drought resistant*. It is propagated by seed or by layers which take a very long time to strike.

Crataeva murvala (The Sacred Barna). There are several distinct species grouped under this name. A

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medium-sized tree, 30 to 40 feet, with smooth pale grey bark and white, pale yellow or reddish yellow flowers. Growth is slow and protection from cattle is necessary. Very handsome when in flower in April or May. *Deciduous* during the cold weather.

Croton oblongifolia (Arjuna).—*Almost evergreen*; height 30 to 35 feet; habit compact and roundly pyramidal; moderately fast in growth. A beautiful, bright-foliaged garden tree and specially fine when the foliage is red tinted in March.

Diospyros embryopteris (Gab).—*Evergreen*, 20 to 30 feet in height. Habit low, dense and spreading. The fine bright glossy green foliage and compact habit make this a valuable garden tree. The big round russet fruits are attractive but not edible.

Grevillea robusta (The Silver Oak).—A moderate-sized *evergreen* tree with beautiful fernlike foliage. Habit erect and pyramidal, growth fairly rapid. A perfect small avenue or specimen tree. Fair soil moisture is necessary for development. (Australia).

**Gliricidia maculata* or *sepium* (Madre Tree of South America).—A small, elegant and quick-growing tree with arching branches and feathery foliage somewhat reminiscent of the Cassias. The tree sheds almost all its leaves during the cold weather when it flowers. Strikingly beautiful in bloom when its branches are covered with masses of pinkish-purple or pale pink flowers which grow in clusters. The rapid growth of the tree and its long leafy branches recommend it as a useful shade tree for compounds and for green manuring. The whole tree is rich in nitrogen, the dried leaves smelling like new-mown hay. Easily raised from seed or cuttings which should be 5 to 6 feet long when planted.

Guaiacum officinale (The Lignum Vitæ Tree).—The tree grows to a height of 30-40 feet. The stem is generally crooked, the dense crowns of close-growing

These trees particularly are recommended for gardens with limited scope.

foliage giving the trees a rounded, compact, neat appearance. *Evergreen* and distinctly ornamental on a lawn. The beautiful blue flowers grow in great clusters at the end of the branches almost covering the tree. The tree flowers at the end of the cold season and at the commencement of the hot weather. It thrives in Madras, Bombay and Sind. Propagated by seed. Native of West Indies.

**Jacaranda mimosæfolia*.—A small tree, 50 feet or more in height, extremely handsome with its symmetrical foliage, finely cut as a fern. It perhaps ranks among the best flowering trees for sub-tropical and tropical regions. It does not seem to do well near the sea but thrives in North and Central India. The flowers are violet-blue in colour at first but the colour varies, some flowers being almost mauve. The tree flowers generally in March. Propagated by cuttings of half-ripened wood. It stands pruning well and can be kept in regular form.

Melia azedarach (Bakain).—*Deciduous*; height 30 to 35 feet; drought resistant; well treated, it is very rapid in growth and a very shapely small tree. Its lilac blossoms are profusely borne and very pretty.

Moringa pterygosperma (Horse Radish Tree).—*Deciduous*; height 30 to 40 feet; habit erect, foliage feathery and graceful. The roots and seeds are used as a substitute for horse radish.

Phyllanthus emblica (Amla).—*Deciduous*; height 30 to 40 feet; free and open habit; fairly rapid in growth. Few trees can rival the beautiful delicate mimosa-like foliage of the Amla.

Plumeria acutifolia (The Pagoda Tree or Kishera Champa).—This tree is frequently cultivated in the neighbourhood of temples, where it supplies the continuous demand for fragrant flowers used as votive

*These trees particularly are recommended for gardens with limited scope.

offerings. It grows to a height of 15 to 20 feet. The leaves, over a foot in length, grow in crowded spirals at the tips of the branches. The tree sheds its leaves during November and December and does not renew them till the commencement of the rains. During this period and until it begins to flower, the tree has an uncouth and gouty appearance.

Plumeria rubra and *Plumeria alba* (The Frangipani, red and white).—Smaller than the Pagoda Tree, the Frangipani grows to a height of 12 to 15 feet. With its beautiful red and white flowers (two varieties), and handsome foliage, it is especially ornamental. The flowers have a pleasant scent which is not so overpowering as those of the Pagoda Tree. Easily raised from cuttings.

Polyalthia longifolia (Asoke or Debdar).—A fairly tall, *evergreen* tree with a straight stem and rather slender branches. Undulate leaves make the tree rather conspicuous. Flowers yellowish green on long slender stalks, appearing from February to April. An ornamental tree which needs to be sheltered from hot, dry winds. Moisture-loving; slow growing.

Pongamia glabra (Papar).—A medium-sized, *nearly evergreen* tree, 40 to 45 feet in height. *Drought resistant*. Useful as an ornamental and shade tree. In some places the leaves are disfigured by round grey spots caused by an insect which mines in the leaf, eating the green tissue. When so affected, the tree is unsightly.

**Putranjiva roxburghii* (Gutajan).—*Evergreen*; height 35 to 40 feet; habit compact and gracefully pendulous. Leaves rich green. For garden planting, either as a lawn specimen or for a small avenue, there are few finer evergreen trees.

**Saraca indica* (The Asoka Tree).—A small *evergreen* tree with an erect trunk covered with smooth dark brown or greyish-brown bark, its branches

*These trees particularly are recommended for gardens with limited scope

spreading in every direction form an elegant close-leaved crown. The leaves, which are about a foot in length, grow alternately on the branches. The leaflets are smooth and glossy, firm in texture with slightly waved margins. The young leaves are red in colour, thin and flaccid, and hang vertically downwards for some time after attaining full size. The flowers appear in large compact clusters which spring direct from the heavy branches or from slender terminal twigs. On opening, the flowers are a bright orange and later turn red, giving each cluster a richly variegated tone. In full bloom the Asoka is beautiful, its orange and scarlet clusters of flowers contrasting richly with the dark branches and deep green foliage. Flowers during January to April or May. Propagated by seeds.

**Schinus molle* (Pepper Tree).—This is a beautiful and graceful pendent tree with fine lacy leaves borne on long thin branches. It bears bright pinkish berries and grows to a height of 15 to 20 feet. Originally introduced from South America. It is commonly known as the Australian or Californian Pepper Tree and as the Peruvian Mastic Tree. The leaves, with numerous pairs of lanceolate, serrated leaflets, are so filled with resinous fluid that the least degree of unusual repletion of the tissue causes it to be discharged; thus, they fill the air with fragrance after rain. Flower are yellowish green. The tree will stand a very dry climate if it has a fair amount of soilwater but it dies if planted in heavy clay soil with little drainage. It has a shallow root system which causes it to be easily blown over. Other plants will not grow beneath it. It must be carefully pruned each year as the branches die back a long way and offer a good breeding place for termites and other pests. *Evergreen*.

Solanum macranthum (Night shade or Potato Tree).—A small tree reaching a height of 30 feet or so with yellowish-brown, straight prickles. Large leaves densely covered with fine starlike hairs. Bears showy

*These trees particularly are recommended for gardens with limited scope.

bluish-violet flowers almost throughout the year. Thrives best in a partially shaded position if not exposed to winds. Native of Brazil. Easily propagated from seeds or cuttings.

Sterculia colorata (Bodula).—*Deciduous*; height 35 to 40 feet; habit pyramidal. Lovely in late April and May when the leafless tree is aglow with dainty orange-red flowers. Fairly fast in growth in a moist soil.

Sterculia alata.—*Evergreen*; height 40 feet. An erect, handsome, round-headed clean limbed tree, very suitable for avenue planting and fairly fast in growth. It requires rather moist conditions.

Tecomella undulata.—A small tree with drooping branches and greyish-green foliage. Flowers large, from pale yellow to deep orange. Very handsome when in full bloom and really worthy of cultivation. It is easily propagated from seed or cuttings. Drought-hardy. Flowers between February and April. Greedily browsed by cattle.

Thespesia poulnea (The Bhendi Tree).—The tree reaches a height of 30 to 50 feet, its numerous branches forming a heavy spreading crown of close-set foliage. The tree is *evergreen* and the pale lemon-yellow blooms with a deep maroon centre are very beautiful. The tree flowers throughout the year but particularly at the beginning of the cold season. Drought-resisting, quick growing and very hardy.

II.—FOR LARGER GARDENS, presenting wider scope for planting, the following varieties may be added:—

Albizia procera (Safed Siris).—*Deciduous* from December to February; habit towering and open; growth very rapid; bark greyish-yellow and striking. When viewed from a distance, either grouped or as a specimen, the Safed Siris is a noble tree.

Azadirachta indica (The Neem Tree).—A large tree with bright green leaves and rather small whitish scented flowers appearing from March to May. *Evergreen* but is sensitive to severe frost, especially when

young. Dislikes too much moisture. A fine shade tree, but little thrives in its shade.

Bischofia javanica (Andrikni).—Almost evergreen; height 50 to 70 feet; habit round, free and compact; foliage dense, deep green and shining. Given moderate moisture, growth is rapid and the tree very handsome.

Colvillea racemosa.—Partly deciduous. A moderate-sized tree, 40 to 50 feet, with spreading branches. In general form and character of its foliage it might easily be mistaken for the Gold Mohur. The flowers are curious and striking, their colour ranging from bright orange to red. The tree flowers in July and August. Easily propagated from seeds. (From Madagascar).

Erythrina indica (Indian Coral Tree).—A moderate-sized tree, reaching 60 feet in height with a straight trunk and numerous branches. The branchlets are armed with small prickles up to the third or fourth year. The flowers, which are large and numerous, of a bright dazzling scarlet, growing in single or several racemes at the end of the branchlets, appear before the leaves and are arranged in clusters. Flowers from February to May. The soil benefits from the presence of this tree and it is a useful shade tree. It also serves in poultry runs and vineyards as it is full of leaves and very shady during the hottest months, affords shelter from the intense heat and keeps the ground moist. In the cold weather the leaves drop and the area is exposed to sun and weather. The tree is also used for making hedges and fences. Being armed with numerous prickles it serves as an excellent hedge plant to keep cattle from cultivated gardens. It propagates easily from seeds or cuttings—cuttings 6 feet long by 3 inches across root readily when planted.

Erythrina suberosa.—This is another variety of *Erythrina*. A medium-sized, deciduous tree, with rough, corky, deeply cracked, light grey bark. The old leaves are shed during the cold season. The

young leaves appear in March or April, generally shortly before the beautiful scarlet flowers open.

Erythrina parcelli.—This is still another variety of *Erythrina* which has handsome variegated foliage and bears orange-coloured flowers.

Eucalyptus citriodora.—The glistening cream-coloured shaft, which rises to a height of 80 to 90 feet, is crowned by a light airy head of delicate leafage. A most graceful tree when grouped or standing alone. The leaves are lemon-scented. (From Australia).

Eucalyptus rostrata (The Red Gum of Victoria).—The most suitable of the large variety of *Eucalypti* that thrive in India. *Evergreen* and quick-growing. Excellent as specimens in extensive lawns.

Eugenia jambolana (Jaman Tree).—A large *evergreen* tree, with long narrow shining leaves; of compact habit. Produces the well-known Jaman fruit. One of the finest shade trees.

Ficus infectoria (Pilkhan).—*Practically evergreen*; height 30 to 35 feet. One of the ornamental figs, producing a large shapely crown clothed heavily with dark green leaves which assume crimson tints before falling and when in new foliage. Habit compact and growth very rapid.

Ficus refusa.—*Evergreen*. A giant spreading shade tree. The small leaves are lucid shiny green and densely furnish the branches. Perhaps the best of the *Ficus* family.

Kigelia pinnata (The Sausage Tree).—Height 40 to 50 feet. A medium to large, quick-growing tree, of vigorous shapely habit. It is not browsed by cattle. *Deciduous*. The large bell-shaped flowers are maroon-coloured and rather curious.

**Lagerstræmia flos reginæ* (The Queen's Flower).—This tree is very particular as regards its water

*These trees particularly are recommended for gardens with limited scope.

supply and a good specimen is seldom seen unless situated on the edge of a *kachha* tank where its roots have free access to moisture or on a low-lying garden plot where heavy canal irrigation is regularly carried out. Given such conditions it is of quick growth and flowers freely when 3 years old. The tree is a beautiful sight when in flower from May to July. There are various shades of colour in the flowers, some being purple and others different shades of mauve, approaching to pink, and these light pinkish-mauve varieties are perhaps the most beautiful. The tree sheds its leaves during the cold weather when some leaves turn coppery red and yellow. The young leaves come out with the blossoms in May. Then the tree is a delight to the eye. Thrives in Southern India and is very often cultivated in the United Provinces. Propagated from seeds and stands transplanting well.

Mimusops elengi (Māulsari).—A medium-sized, evergreen tree with white and highly scented flowers. Graceful form and shining foliage. Very slow in growth.

**Peltophorum ferrugineum* or *inerme* (The Rusty Shield-Bearer).—A large handsome tree growing from 40 to 70 feet in height. The feathery, mimosa-like leaves add to its handsome appearance. Leaves fall during December and January and the tree presents an untidy appearance. Young leaves come out in February when the trees are mantled in the tenderest green. About mid-February rust-red upright shoots spring up at the ends of the branches and develop into many branched sprays bearing a profusion of bright yellow flowers. Crowned in their abundance of flowers, the trees are a wonderful sight. The copper-red seed pods cover the tree in profusion. They are particularly conspicuous during leaf fall. Planted alternately with Gold Mohur, the trees make a wonderful blaze of colour in April and May, their bright yellow crowns contrasting with the scarlet heads of the Gold Mohurs. It also blends beautifully with *Cassia fistula* (The

*These trees particularly are recommended for gardens with limited scope.

Indian Laburnum). The tree is easily propagated by seed. Native of the Malay Peninsula and North Australia.

Pithecolobium saman (The Rain Tree).—A large tree of rapid growth. Native of Brazil. Its name "Rain Tree" is derived from the falling liquid excreta of cicadæ insects which abound on the tree in Central America. Given space to develop and sure foothold, has enormous power to resist strong winds. When grown in a garden it becomes lazy and shallow rooted, for its rootlets get attracted to the rich manure and water of the garden and have a harmful effect on other plants. The pinnate leaves have the remarkable quality of not only "sleeping" at night, but of responding to the meteorological conditions of their environment. During full exposure to sunlight, they maintain a complete expansion and afford a dense shade but at night or during rain, the stalks droop and the leaflets turn round so that they face sideways. There are two distinct seasons of blooming, the first in March, the second after the rains, when the tree flushes to a greater degree and is converted into an enormous bouquet. The pod is dark and angular with many seeds embedded in a sweet pulp and is considered a useful food in times of scarcity. The tree does not stand the colder parts of Northern India. It is not particular as to soil and will thrive even in comparatively dry climates, though it grows best in a moist climate. Easily raised from seeds and cuttings.

**Poinciana regia* or *Delonix regia* (The Gold Mohur).—A large *deciduous* tree growing from 40 to 50 feet in height, with spreading branches and very handsome feathery leaves. This well-known tree is the most outstanding feature of Indian gardens in May, but is not thoroughly at home on the dry plains of Upper India, disliking a hot, dry atmosphere and being more at home where more favourable conditions prevail. Given copious and deep irrigation and a

*These trees particularly are recommended for gardens with limited scope.

sheltered position from strong winds, it forms an excellent garden subject both in foliage and flower. On a dry situation it is useless. It will thrive for a time as a young plant, with sporadic watering, but once its roots have extended, lack of moisture brings about early decay. The tree sheds its leaves in February and March and during this period it stands gaunt and bare save for its seed pods. The flowers appear with the onset of the hot weather, a few at a time, till by mid-May the tree is a vivid and brilliant mass of scarlet blossoms. The young leaves appear shortly after the first flowers and by the time the rains are well established the tree is covered with its feathery foliage. The tree is largely grown for shade and decorative purposes but attention must be paid to pruning it if a good head is to be developed. The flowers vary considerably in intensity of colouring, the deep scarlet form being the most handsome. This tree can be planted alternately or for mass effect with *Cassia fistula* (Indian Laburnum) and *Peltophorum ferrugineum* (Rusty Shield-Bearer), when a wonderful colour scheme will result. Usually grown from seed ; also raised from cuttings. It is advisable to propagate by cuttings if true colour is required to be maintained. The Gold Mohur has superficial spreading roots which kill out other plants. The shallow root system unfortunately renders it liable to be blown down during storms. Native of Madagascar.

Pterospermum acerifolium (Kanak Champa).—*Evergreen*; height 60 to 70 feet ; habit usually loose and straggly. The grand, bold tropical foliage and the large, sweet cream-coloured flowers combine to make this a most desirable tree.

Spathodea campanulata (The Scarlet Bell or Fountain Tree).—The *Spathodeas*, of which there are two or three species, are handsome *evergreen* trees with large pinnate leaves and very showy orange-red or scarlet flowers. Tall and erect, it grows to a height of 70 feet and attains fine proportions when it has not to contend against high winds. For scenic planting

in extensive grounds, this is one of the finest trees. It thrives well up to an altitude of 4,000 feet and is suited to districts where the rainfall is not too great. Flowers generally during the cold weather, particularly in February and March. Easily propagated from root suckers or from cuttings. Native of tropical Africa.

Tamarindus indica (Imli).—A splendid evergreen shade tree with beautiful foliage of slow growth. The fruits are very sour and are popularly used for sauces and *shirbets*. It possesses the disadvantage that other plant life will not thrive in its vicinity.

Terminalia arjuna.—Evergreen; height 80 to 100 feet. Leaves are broad and deep glossy green. Rapid in growth and fairly drought-resistant. One of the grandest of evergreen Indian trees.

CHAPTER III—SHRUBS AND SHRUBBERIES

Where every shrub, and flower's seen to reign
In its own garden, like a fairy queen,
Whose winning smiles invite thee, and enchain
Thy heart for ever there to fondle o'er its fane.

H. G. HELLON.

THE cultivation of shrubberies in private gardens is more or less of recent origin.

Before the planting of shrubberies was attempted, the usual practice was to secure privacy and partition by planting formal hedges. Evidence of this is to be found in most compound gardens in the plains of India.

The use of shrubberies is a considerable improvement on hedges; not only can they be designed to secure privacy but to obscure generally the hard and severe outline of compound walls and fences and to limit, within reasonable bounds, large and untidy areas which more often than not constitute the compounds of bungalows and houses in the mofussil. The labour and cost of maintaining and trimming hedges, moreover, compares unfavourably with the labour and cost involved in the upkeep of shrubberies. Well planned shrubberies, in which foliage and colour effect

are carefully considered, should form one of the most attractive features of a garden.

There is almost an unlimited variety of plants falling within the broad category of shrubs, but excellent results can be secured in small gardens by using a comparatively small number of distinct varieties that can be propagated easily and which succeed remarkably well with reasonable care. A shrubbery composed of such selected varieties will be found more satisfactory than one containing an extensive collection of individual plants.

Considerable colour and variety can be introduced in a shrubbery by including hardy flowering climbers.

Shrubberies are primarily intended to secure privacy and it is by no means necessary that they should deliberately follow the severe lines of boundary walls and fences. The inner line of the shrubbery should be so designed as to round off hard angles and secure soft and pleasing effects. If, however, a formal effect is essential, a shrubbery can be designed to this end, but in this case, the front or inner line must be demarcated by a dwarf hedge.

The width of a shrubbery should invariably be dictated by the height that is required. A reasonably good effect with a height of 15-18 feet can be obtained with two or three rows of shrubs planted in a bed of average width of 10 feet, but when the area of ground available permits, a wider shrubbery should be made and will be found more effective. The width of the shrubbery should be varied so as to obtain a variation in height, a pleasing frontage and a broken sky-line. A well planned shrubbery is useful in giving either length or breadth to a garden.

The portion of the shrubbery flanking the entrance gates can suitably be widened so as to make the entrance prominent and to screen off the garden from the public road.

In larger gardens, the shrubbery can also be backed by dwarf flowering and ornamental foliage trees. These trees can be actually planted in shrubberies that are 40-50 feet wide and can also be planted, in specially prepared holes, 15-20 feet in rear of small shrubberies. If planted nearer, their shade is likely to affect the shrubbery adversely.

The trees well-suited for this purpose are the following :—

- Acacia auriculaeformis*.
- Averrhoa carambola*.
- Bauhinia Triandra* (Geranium Tree).
- Bauhinia Triandra purpurea*.
- Cassia fistula* (Indian Laburnum).
- Cassia javanica*.
- Cassia nodosa*.
- Cassia marginata*.
- Cassia multijuga*.
- Gliricidia maculata* (or *sepium*).
- Grevillea robusta*.
- Jacaranda mimosæfolia*.
- Phyllanthus emblica*.
- Putranjiva roxburghii*.
- Schinus molle*.
- Solanum macranthum*.

The above trees, a description of which will be found in the chapter on Trees, can be planted at intervals of 30-40 feet or so and will soon give an almost perfect background to a shrubbery and outline to a compound, picking up well with larger roadside trees.

The Golden Bamboo (*Bambusa aurea striata*) may also well be used to fill up odd corners, etc., in large gardens. In small gardens its use is to be deprecated as its growth is overpowering and it attracts the more common varieties of birds (parrots, minas and sparrows), all destructive and noisy visitors to a garden.

In the lay-out of the shrubbery, the following should be borne in mind—

- (1) The shade of trees should, as far as possible, be avoided. Very few shrubs do well in the shade. It is an advantage, therefore, to have the shrubbery at least 15 to 20 feet in front of the boundary line of trees. If the trees are large and of spreading habit, an even greater margin is desirable.
- (2) If the shrubbery line is kept in front of and clear of the boundary trees, a very pleasing effect will be obtained which will give an amazing idea of space.
- (3) The best results are to be found in shrubs facing East and South.
- (4) Allow greater width where greater height is wanted.
- (5) Greater height is necessary in shrubberies a good distance away from the house. Nearer shrubberies can be lower in height.
- (6) Use the shrubbery to hide ugly land-marks, such as servants' quarters, vegetable gardens, tennis courts, etc.
- (7) Use the shrubbery to limit gardens in large compounds which cannot for any reason be entirely brought under cultivation.

Those not familiar with scale drawing and planning will find it difficult, if not impossible, to attempt the lay-out of the shrubbery on paper. The easiest and most practical way is to get to work direct on the ground.

Having determined generally on the width and location of the shrubbery, a simple way to secure a pleasing outline is to take a good length of fairly thick cotton rope and, after having soaked it in water to weight it, lay it easily on the ground along the inner alignment of the proposed bed. The rope can then be moved gradually into position until the outline pleases the eye and the curves satisfy. Further assistance in

this matter, if required, can be obtained by placing on the rope line, flower pots of foliage plants and by moving these about until the desired result is secured. After the outline has been accepted, the enclosing lines of the bed should immediately be nicked in the ground ; (the *mali* will call this *dagbelled*).

The outer line of the shrubbery can be determined by the line of the compound boundary but should generally be at least 3-4 feet clear of the boundary wall or fence.

After the alignment has been fixed to the best advantage, about 6 inches of surface soil should be removed and the exposed surface trenched to a regular depth of $2\frac{1}{2}$ feet. If the soil is good the earth so removed can be spread over any unprepared part of the garden, *c.g.*, vegetable gardens or lawns, where it will prove beneficial.

Malis are apt to skimp digging and, to ensure that this is done properly, the following process may be followed. Earth to a depth of $2\frac{1}{2}$ feet for the full width of the shrubbery should be entirely removed from one end of the bed for about $\frac{1}{4}$ running feet. The rest of the bed should then be dug to the required depth of $2\frac{1}{2}$ feet in lengths of 18 inches at a time, the earth being moved progressively to the further end of the excavated portion of the bed. All roots and weeds should be carefully removed or buried deeply during the process of digging. When the bed has been completely trenched in this way the earth originally moved should be carried and placed in the other end of the bed. In order to avoid unnecessary carriage, the shrubbery may be treated in this manner in lengths of 50 feet or so at a time.

This process will ensure thorough trenching and it will only be necessary to see that all large clods of earth are carefully broken up as the work progresses. If this is not done, there is likely to be settlement when

the bed is irrigated, with unfortunate results after the bed has been planted.

After trenching has been finished, 3 or 4 inches of well rotted stable manure, compost manure, or sifted city sweepings should be spread on the bed and well-mixed with the upper 12 inches of soil. The surface should then be roughly dressed and the bed irrigated thoroughly. The surface should afterwards again be carefully levelled and dressed so as to ensure proper watering after planting.

If the soil in the garden is alkaline or otherwise unsuitable for plant life, the bad surface soil should be removed to a depth of at least 18 inches. The exposed surface should then be trenched to a depth of 18 inches and sweet soil (to a depth of 12 inches) and manure (to a depth of 3 or 4 inches) should be added. The beds should finally be levelled and completed as described above.

In localities in which the cost of sweet soil and manure is appreciable, the following more economical method of treatment may be adopted.

About 6 inches of surface soil should be removed and the exposed surface trenched to a regular depth of $2\frac{1}{2}$ feet/in accordance with the procedure previously described. It is necessary to see that all clods of earth are carefully broken up as trenching progresses. The bed should then be roughly dressed.

After completion of the work as above, holes (3 ft. \times 3 ft. \times $1\frac{1}{2}$ ft.) should be prepared for each plant by the removal of 18 inches of bad soil and its replacement by 12 inches of sweet earth and 4 inches manure.

The cost of preparation of shrubberies, according to the various methods described above, can be worked out by applying the local rates to the following quantities :—

*For a shrubbery 100 ft. long and 10 ft. wide average,
or 1,000 sq. ft.*

In good soil.	In alkaline or unsuitable soil (Ordinary method).
1. Removal of 6" of surface soil ... 500 c. ft. 2. Trenching to a depth of 2½ ft. ... 2500 c. ft. (It should be noted that the cost for this is much cheaper than the cost of excavation, removal and refilling). 3. Stable or compost manure (4") ... 300 c. ft. 4. Cost of about 80 plants (Planting in 3 rows).	1. Excavation & removal of surface soil (18") ... 1500 c. ft. 2. Trenching (18") ... 1500 c. ft. 3. Sweet earth (12") ... 1000 c. ft. 4. Stable or compost manure (4") ... 300 c. ft. 5. Cost of about 80 plants (Planting in 3 rows) In alkaline or unsuitable soil (more economical method) 1. Removal of 6" surface soil ... 500 c. ft. 2. Trenching to a depth of 2½ feet ... 2500 c. ft. 3. Sweet earth for 80 holes (3' x 3' x 12") ... 720 c. ft. 4. Stable or compost manure for 80 holes (3' x 3' x 4") ... 240 c. ft. 5. Cost of 80 plants.

The preparation of the beds as described above should be completed by the end of January and planting can then commence. It is desirable that the planting of the shrubs should be completed by the end of February. After this the heat rapidly increases and the greater the heat the greater the strain on the transplanted plants. If the succeeding rains are favourable, the shrubs will grow apace and a real ornamental value will be obtained in the ensuing cold weather.

While the ground work is being completed, the selection and collection of specimens should be made. Shrubberies form a permanent feature of the garden and cannot be changed from year to year. Once planted and established, no alterations can be made without adversely affecting uniformity of growth. It is, therefore, necessary that the best possible selection should be made in the first instance and that the shrubs should be correctly distributed. If funds do not permit of a large number of shrubs being purchased at one

time, sufficient may be obtained for one length and enough plants for the remaining portion of the shrubbery can be propagated from this collection by the next season. Meanwhile, the rest of the shrubbery may be planted with temporary shrubs, etc., grown from seed. A list of plants suitable for this purpose is given later in this chapter.

The distribution of the selected shrubs requires to be very carefully done, as on this will largely depend the success of the shrubbery.

The dwarf shrubs in the front line should be planted about 12 inches from the inner edge of the bed. In this position they will fall gracefully over the adjoining lawn and entirely hide the unsightly surface of the bed.

The tall, or back line, shrubs should be planted 12 inches to 18 inches from the outer edge of the bed.

The intermediate shrubs should be planted in one or more lines (as space indicates) between the tall and dwarf varieties.

The distance between lines of tall and intermediate shrubs should be about $4\frac{1}{2}'$ and between lines of intermediate and dwarf shrubs about $3'$.

The tall varieties can be planted at intervals of 10 to 12 feet. In very large shrubberies, two or even three varieties can be planted together for better effect.

Shrubs in the intermediate line should be planted at intervals of 5-6 feet. In this line it is desirable to plant two or more shrubs of the same variety adjacent to each other. Grouped in this way, the shrubs stand out more clearly and their colour and beauty are more impressive. Intermediate shrubs particularly need to be grouped informally, and, in order to avoid an even, graded appearance, a few taller growing shrubs of bushy habit should be interspersed.

The distribution of these shrubs should be made with regard to the varieties selected for the back line and with reference to the detailed description of each variety. The various shades of foliage and flowers

can be easily harmonised or successfully contrasted with a little care in selection.

Climbers may best be planted in this line, the different varieties being grouped as in the case of other shrubs. The plants should be adequately supported to the required height and their growth restricted by seasonal pruning. A suitable support can be made of a single strong iron or wooden post 6'6" in length above ground level with three cross pieces at 2 ft., 4 ft. and 6 ft. from the ground.

It is useful to remember to plant in the intermediate line shrubs, such as *Poinsettia*, that do not carry foliage throughout their stems and the bare extremities of which can be hidden by the shrubs in the front line.

The dwarf shrubs should be planted in groups of 4 or 6 plants in a length of 10-15 ft. When treated like this they are much more effective.

In the case of dwarf shrubs the distribution of varieties should be influenced by what is put in the intermediate line ; the detailed description of shrubs at the end of this chapter will be helpful in this respect and should be studied.

In distributing shrubs, as in laying out the bed, it is not necessary to have a scale plan. In the first instance, the distribution can be made roughly on paper working to the approximate dimensions suggested above. The number of plants required can also be calculated in lengths of 50-60 feet, deep corners and wide portions of the shrubbery being allowed for.

The position of the shrubs can be marked on the bed itself with pegs and clearly written labels, which can be moved about till satisfaction is secured. If the labels are splashed with colour to represent the colours of the flowers or foliage of the shrubs, it helps still more in deciding on the distribution. The actual planting of the shrubs is then an easy matter.

When transplanting shrubs, be careful to ensure that there is a good ball of the original earth

round the roots and that the tap root and main side roots are not unduly cut or damaged when lifting the plant. Irrigating plants shortly before transplanting helps to keep the earth firm. When planting make sure that the tap root is upright in the hole.

In addition to their use in shrubberies, shrubs and climbers can also be planted with beautiful effect in groups on lawns. Large and brilliant coloured shrubs and climbers can be used most effectively in this way. Examples are *Bougainvilleas*, *Allamandas* and similar shrubs. Several shrubs of one colour and kind should be planted together, a definite sense of grouping being aimed at.

Beds for groups of shrubs and climbers should be prepared and treated in the same way as beds for shrubberies. The plants also should be similarly planted.

As soon as shrubs have been planted, they must be copiously watered. The surface should, thereafter, be broken up at regular intervals as this ensures that each plant gets its fair share of irrigation and helps to conserve soil moisture by checking surface evaporation.

The shrubberies should continue to be irrigated and cultivated at regular intervals. During the monsoon, irrigation should be suspended as necessary but cultivation should continue. The need for cultivation is explained in the chapter on Cultivation and Tillage, which should be studied.

Newly planted shrubberies will need no other attention during the first year except that it may be necessary to fill up spaces caused by slow growth by interplanting temporary plants of quick growth.

To obtain the best effects, the temporary plants should be sown in fairly large groups, but should not be allowed to smother and retard the monsoon growth of the permanent shrubs. For filling spaces in back positions, the most useful are *jaint*, hollyhocks and castor oil (bronze foliage variety). For middle posi-

tions use *Cassia didymobotrya*, *Tithonia speciosa*, sunflowers, hollyhocks and the common dal (*Cajanus indicus*). After the monsoon, blank spaces along the inner margin may be filled with taller cold-weather flowering annuals, such as miniature sunflowers, annual chrysanthemums and *Nicotiana*. All the varieties mentioned can be grown from seed.

Established shrubberies need careful attention at the close of the winter, *i.e.*, about April. All shrubs and plants used for temporary effect should then be removed and dwarf varieties along the margin, if weak or scanty, should be replaced.

Practically all permanent shrubs will need careful pruning at the close of the winter. Cutting back the growth of trees and shrubs is a very old and traditional practice whereby the fertility and performance of the plants are enhanced. In the case of trees and shrubs treasured for their floral beauty, not only the production of their flowers the following year, but the keeping of their beautiful form, vigour and youth depend upon the timing and manner of their pruning.

The guide to successful pruning is the kind of wood from which the flowers are produced, whether from wood of the previous year or from present-year growth. Trees producing flowers on present-year or new wood are pruned during their dormancy before they begin to grow in the spring, but those which flower on old wood are not pruned until the flowers have faded. Once the flowers have faded, there is no point in delaying the necessary pruning. The sooner the work is done the better, for the plant can then make the best use of the long growing season in reacting to the slight check and preparing for more abundant flowering the following year.

The tendency to symmetrical lopping of growth is to be deplored. Good pruning is characterised by two good practices. It preserves and encourages the natural growth habit and the form of the plant

best suited to its location. It does not show. To get these results, the shrub should be studied before cutting, and a mental picture framed of the shape next season's growth is likely to take. Shrub-pruning is simpler and easier when cutting commences at ground level and works upwards. All superfluous growth, old or weak branches are best cut at ground level or as low as possible without leaving a stub. Little of the work will be visible if care is taken to cut out unwanted growth immediately above a fork or desirable branch. In the absence of either of these, cut off at ground level. Not all shrubs require annual attention, though regular pruning gives smaller and more compact specimens. Shrubs differ from trees largely because they send up more than one stem from the soil, and renew their growth annually by sending up more canes or stems. Some of these must occasionally be removed in the interests of flowering.

Buddlea, *Caryopteris*, *Holmskioldia*, *Polygonum*, *Russelia floribunda*, *Tecoma*, *Thysanaloena*, *Poinsettia*, and other shrubs of this type invariably need pruning back to within 6 inches of the old wood in order to keep them within bounds for the future. Shrubs grown more for foliage effect, such as *Hyptage*, *Schinus*, *Callistemon*, *Duranta*, *Hamelia*, etc., will require individual treatment, taking into consideration their position and state of growth. Further information with regard to pruning will be found in the detailed notes on each variety at the end of this chapter.

For pruning use a pair of secateurs or sharp pruning knife and cut the wood cleanly on the slant about half an inch above a bud.

Pruning creates a demand for more food, and it is always beneficial to mulch the plants after pruning with rotted manure or compost. Such generosity is amply repaid in the formation of new flowering wood and a profusion of bloom next year.

Spread a liberal quantity of manure over the bed and fork in to a depth of 6 inches. If the plants

are in sound health and the growth sufficient, the forking in of dead leaves and other vegetable matter which has collected on the bed during the season will be sufficient. There should be copious irrigation after pruning until new growth is well established. The breaking up of the surface at regular intervals should not be neglected.

If treatment including annual pruning is continued in this way, the shrubbery will give a handsome return for the trouble and expense incurred on its preparation.

The following is a more or less choice selection of shrubs and climbers that can be relied on to produce a good effect. Some varieties are deciduous, some are at their best during the winter months and others during the summer months. As a rule, a cold weather show of foliage and colour is most sought after and the selection of varieties should, therefore, be limited to shrubs that are at their best during winter. Inter-planting such shrubberies with plants that flourish in the summer and look their worst in winter is to be deprecated, especially in small shrubberies. It is preferable to plant the deciduous and summer flowering varieties together in a separate and distant corner of the garden.

Before making a final selection of shrubs, it is necessary to consult the local gardens or otherwise discover by personal investigation what varieties thrive best in the locality. Some varieties do better in some places than in others and it is always best to confine one's choice to those that have succeeded after trial.

When selecting young shrubs from stock, refuse any plants which have been kept in small pots for 3 or 4 years. Such plants will have become starved and root bound and are slow in resuming activity after transplanting.

The classification as regards height is based on average considerations. The tall varieties can be used in the back line of shrubberies averaging 15 feet

in width. If the width is much less than this, and great height is not required, the tall varieties may be dispensed with in the narrow portions of the shrubbery. The plants have been named in the order of merit. This should be remembered by the smaller gardeners whose choice of varieties is limited.

SHRUBS—TALL VARIETIES

Citharexylon subserratum (Fiddlewood).—A tall handsome shrub of regular growth. The foliage develops pretty autumn tints in the winter months. Suitable only for the back line of a shrubbery. It can be pruned back to 8 to 10 feet in April and will then grow to 15-20 ft. by next winter. Stands out well and is for this reason particularly useful to break the sky line of a shrubbery in which it may be planted at intervals of 30-40 feet. Bears sweet-smelling white flowers. *Evergreen*.

Hamelia patens.—A large shrub or dwarf tree, the foliage of which varies from deep brown to almost bright red in different varieties. The colour is accentuated by pretty small red-yellow flowers which are produced almost all the year round. Is tall enough for the back line of a shrubbery and can also be effectively used in the intermediate line where its colour stands out well against taller growing shrubs, such as *Schinus* and Fiddlewood. *Evergreen*.

Schinus terbinthifolia.—A tall hardy shrub, with aromatic leaves. Very suitable for the back line of a shrubbery where its dark green foliage affords an excellent background for smaller varieties. Should not be pruned too hard; needs only to be trimmed in April as circumstances dictate. Propagated by cuttings but more easily raised from seeds in March. Can be effectively used for breaking the sky line of a shrubbery along with Fiddlewood. *Evergreen*.

Caryopteris wallichiana.—A tall flowering shrub with dark green foliage that looks best when in flower towards the end of the cold weather. There are two distinct types—one of tall, stiff and unsightly

growth and the other of graceful, spreading habit. The latter should be used. There are various flowering varieties (blue, mauve, white and pink). The blue is the best of the lot but the white is also pretty. Suitable for the back line of a narrow shrubbery and for the intermediate line of a deep shrubbery. Withstands the frosts; should be pruned hard in April after flowering, to within 6 inches to 8 inches of old wood. Easily propagated by cuttings in March-April. *Evergreen*. Winter flowering.

Tecoma stans.—A tall erect shrub that bears clusters of yellow flowers almost throughout the year. Suitable for the back line of a shrubbery. Very hardy, but unfortunately the foliage is apt to turn yellow during the cold winter months. For this reason should not be used in smaller shrubberies. Should be pruned hard in April. *Evergreen*.

Callistemon lanceolata (The Bottle Brush).—A handsome, tall shrub which develops gracefully and bears pretty red flowers (not unlike a bottle brush in formation) towards the end of the winter. Is only suitable for the back line of a wide shrubbery as the shrub grows very tall and cannot be pruned annually like other shrubs. Withstands frost fairly well and is propagated by seed sown in June-July. *Evergreen*.

Murraya exotica (Bilgar).—A large, bold, handsome *evergreen* shrub. The white flowers resemble orange blossoms and are fragrant. It is rapid in growth and prefers shade and moisture. Propagated by seed sown in March.

Artabotrys odoratissimus.—A large shrub with dense green foliage and greenish yellow fragrant flowers. Suitable for the back line of a shrubbery. Is at first slow in growth, but eventually forms good specimen plants. No pruning is necessary. Propagated by seed and layers, preferably by the latter method. The layers require 8-10 months for establishment and need constant watering. *Evergreen*.

Michelia fuscata (Chin-ka-Champa).—A tall, handsome, *evergreen* shrub, with sweetly scented flowers. A great favourite in Hindu gardens. Propagated by layers or by seed.

Woodfordia floribunda.—A bold *deciduous* shrub of rapid growth and easy culture. The bright brick red flowers wreath every twig in early spring when the bush glows with colour. Suitable for the back line of deep shrubberies. Requires careful pruning and trimming and should not be cut back too far.

Oncoba natalensis (Spinosa).—Large spiny, ornamental shrub. Flowers white and formed like a single rose. Summer flowering. Should be used if only because of its flowers which are excellently suited for low bowls.

Lagerstrœmia indica (Indian Lilac or the Crepe Myrtle).—Beautiful, erect growing shrubs of very easy growth and equally floriferous. Useful and charming during the hot months of June and August. There are three distinct varieties, *rosea*, (pink flowers), *alba* (white flowers) and *purpurea* (purple-mauve flowers). Unfortunately the shrubs are *deciduous* and untidy during the winter months. They are therefore unsuitable for a shrubbery required for cold weather effect. An effort should be made, however, to fit these plants into an odd corner of the garden where they will be unnoticed during the winter. The flowers are useful for cut work when other flowers are scarce.

Nyctanthus arbor tristis.—A large *deciduous* shrub or small tree bearing sweet-scented flowers during the rains. The flowers open at night and fade in the morning and fall off. Not suitable for a shrubbery in which a cold weather effect is desired.

Poinciana pulcherrima (Barbados Pride).—Tall growing shrub of the Gold Mohur family. There are two varieties, one bearing scarlet flowers and another yellow flowers. Summer flowering. *Deciduous*. Propagated by cutting. Unsuitable for a shrubbery in which a cold weather effect is desired.

Sophora tomentosa.—A tall, handsome *evergreen* shrub; bears large clusters of bright yellow flowers throughout the summer months; foliage grey. Propagated by seed sown in April or May.

Buddleia madagascarensis.—A hardy and very large shrub with grey-white foliage. Of rampant and spreading growth; should only be used in shrubberies of great depth or in deep "corners" where its spreading habit will not destroy or dominate other plants. Withstands frost and bears long sprays of deep yellow and white flowers (two varieties) in the spring. The flowers give a powerful but not unpleasant scent. Can be propagated fairly easily by cuttings planted in the spring. Should be pruned hard in April to within 6 inches of old wood. *Evergreen*.

Buddleia lindleyana.—A rampant shrub or small tree. A well-grown plant is very fine when draped in reddish purple flowers during the cold season.

SHRUBS—INTERMEDIATE VARIETIES

Acalypha.—There are a good many varieties of this hardy *evergreen* shrub. One variety, *tricolor*, has striking large leaves of different colours and grows comparatively to a great height. Another variety, *colorata*, has brilliant reddish-bronze leaves, and a third, *marginata*, has leaves with a distinct white margin. The majority are of intermediate habit and thrive and look their best in a sunny position. It is, however, one of the few shrubs that does reasonably well in a shady position although the colour is not then so effective. Admirable for the intermediate line of a shrubbery where it can be seen to advantage if grown in small clumps of 3 or 4 plants; can also be used effectively in the front line in a warm sunny position, as the foliage then generally covers the plant well. Young plants can be used for house decoration if grown in tubs or large flower pots. Some varieties are badly affected by frost. If the growing tips are "pinched" in October/November, the new leaves show better colour and are able to withstand the

cold better. Easily propagated by cuttings in the spring and rains. Must be used in all shrubberies.

Buddlea asiatica.—A very pretty and compact growing type of *Buddlea*. Suitable for intermediate planting and blends prettily with *Caryopteris* (blue). The silver grey foliage lends a striking contrast in the shrubbery and the plants bear pretty white flowers towards the end of the winter. Withstands frost. Can be propagated easily by cuttings planted in March. Should be pruned hard in April. Vernacular name—*Didhia* Dun. *Evergreen*.

Buddlea diversifolia.—An erect, compact growing shrub with blue flowers which are sparingly borne in March. Height 4-5 feet.

Duranta plumieri.—A beautiful *evergreen* shrub with small blue and white flowers (two varieties) which are succeeded by bunches of pretty yellow berries. Can be used effectively in the middle line of a shrubbery; blends particularly well with the *Acalyphas* and the climbers, *Bougainvillea Mrs. Butt* and *Louis Wathen*. The plants are very hardy and withstand frost. They should not be pruned severely and will do with a trimming from time to time to keep them within bounds. The white variety is subject to attack by red spider. Easily propagated by cuttings in February/March. The *Duranta* is one of the few shrubs that is satisfactory in the shade. Must be used in all shrubberies.

Phyllanthus Myrtifolium.—This is one of the most suitable shrubs for the intermediate line and can be used equally effectively as single specimens in the front line. Of quick and formal growth. The foliage is ornamental and dark green and the plant bears pretty red berries in the winter. It can be used for grouping on lawns, etc. Somewhat affected by frost. Should be pruned hard in April. Propagated by seed and cuttings planted in the spring. *Evergreen*. Should find a place in all shrubberies.

Thysanaloena agrostis.—A large ornamental grass

with broad-leaved stems 8 to 10 feet in height. Bears pretty brown coloured flowers throughout the winter months. Suitable for the intermediate line of a wide shrubbery or for the back line of a small one. Needs regular irrigation. Very easily grown from cuttings and division in spring. Should be pruned hard in April. *Evergreen* and very suitable for winter effect.

Holmskioldia sanguinea.—A tall, spreading shrub which bears flowers of striking brick red colour all along the stems. Looks beautiful during the winter months. There are more than one type of this shrub and the one with closely placed double flowers is to be preferred. Suitable for the intermediate line of a shrubbery or for grouping in clumps in open spaces. Looks best if planted between evergreen shrubs. Hardy and easily propagated by cuttings in March/April. Should be pruned sufficiently to restrict its growth and spread. Vernacular name—Kultolia.

Arundo donax variegata.—A tall, handsome variety of grass. The graceful, green foliage is variegated with white. Very suitable for the intermediate line of a shrubbery where its contrasting foliage is delightful. In April old stems should be cut back to ground level. Propagated by cuttings and suckers during spring and the rains.

Sophora secundiflora.—An erect, medium-sized *evergreen* shrub. The pinnate foliage is deep green and pleasing. The lilac blue fragrant clusters of flowers blossom in spring.

Cestrum nocturnum (The Night Blooming Jessamine).—An *evergreen* shrub of spreading habit that looks very well in the intermediate or front line of a shrubbery. The foliage is bright green and the insignificant greenish white flowers give off a powerful perfume at night. Very hardy and easy to propagate by cuttings. Should be pruned fairly hard in April.

Hamiltonia suaveolens.—A medium-sized heavy looking shrub that bears bunches of sweet-scented

striking white flowers, touched with blue, towards the end of winter. Worth a place in the intermediate or front line of a shrubbery. Should be pruned hard after flowering. Propagated by cuttings in January-February.

Hibiscus rosa sinensis brilliantissimum.—This is the hardiest and best of the *Hibiscus* for purposes of the shrubbery. It is *evergreen* with bright foliage and bears striking crimson flowers during the warm months. Very suitable for the intermediate line of a shrubbery. There are other varieties of which the most suitable is one similar in growth to *rosa sinensis*, which bears salmon coloured blooms.

Reinwardtia monogyna (Basunth).—A free flowering shrub, with orange coloured flowers, of medium height. Pruned hard in April. Propagated by cuttings and suckers in April.

Cassia glauca.—Hardy, evergreen shrub, attaining 8 to 12 feet height. It flowers during various months of the year, principally during the cold season. Pretty sulphur-yellow flowers. Drought resisting. There is another variety, *Cassia alata*, very similar in habit but with more delicate foliage.

Cassia didymobrya.—An *evergreen* shrub, producing a succession of beautiful yellow flowers between December and April. Of very quick growth; suitable also for a temporary shrubbery. Intermediate habit. Propagated by seed sown in June.

Dombeya mastersii.—Bears fragrant cream and white flowers. Suitable for the intermediate line of a deep shrubbery. Should be pruned after flowering. Easily raised from cuttings in March. *Evergreen*. Summer flowering.

Ixoras.—These should find place in any garden in a humid district. They are handsome shrubs and useful for producing cut flowers. Regular cleaning is all that is necessary in the way of pruning. The more beautiful varieties are Prince of Orange, *Singaporensis venusta*, *Javanica* and *Cocinea magnifica*.

Euphorbia pulcherima (Poinsettia).—Bears coloured bracts or bracteal leaves of bright red, soft pink or pale yellow colour. Are very attractive in the winter. Poinsettias should be pruned severely and not allowed to get thin or overgrown. The plants should be cut back in February/March when the bracts fade and the foliage is untidy. Should be massed in the intermediate line of shrubberies to secure best effect.

Jatropha panduræfolia.—Has glossy dark leaves and cherry-red flowers. Not showy but very pretty with its clear cut flowers. Should be pruned severely.

CLIMBERS SUITABLE FOR SHRUBBERIES

Allamanda Grandiflora.—A large, superb evergreen shrub of scandent and rambling habit. Flowers large of bright yellow colour appearing in clusters. The plant is in constant blossom during the hot and rainy season. Can be used as a climbing vine or as a creeping ground cover. It prefers a sunny position and well-drained soil with a good supply of water. It is propagated by layers or cuttings of the mature wood. The branches should be well thinned and pruned during the cold season.

Bougainvillea (Mrs. Butt).—Evergreen. Bears very pretty flowers of a deep cerise colour almost throughout the year. One of the quickest growers and flowers very freely. It is one of the best of the *Bougainvillea* and can be effectively used in shrubberies if supported adequately. The required height can be obtained by pruning which can be done two or three times a year.

Bougainvillea (Louis Wathen).—Evergreen. Another very strong growing variety of *Bougainvillea* which bears striking flowers which are reddish orange when they open and fade to a pretty salmon pink. The flowers blend very happily with *Petroea volubilis*. Needs similar treatment to Mrs. Butt.

Baumontia grandiflora.—Evergreen, broad-leaved climber. Flowers pure white, scented and trumpet-

shaped. Very hardy and excellent for a shrubbery if strongly supported. Flowers in the spring.

Hiptage madhablota.—A large shrubby climber of quick growth. Flowers pale yellow and slightly fragrant during March. *Evergreen*.

Jasminum grandiflora (The Chambeil).—A shrubby climber with masses of white fragrant flowers. Hardy and vigorous. Should be controlled by pruning or will soon overgrow plants in the vicinity. *Evergreen*. Winter flowering.

Jasminum humile.—One of the hardiest Jasminums; of strong growth and suitable for shrubberies or lawn specimens. Flowers yellow, produced in spring. *Evergreen*.

Petroca volubilis.—A vigorous *evergreen* climber. Produces violet-blue flowers early in spring. Blends very well with red and salmon-pink *Bougainvilleas* which flower at the same time.

Tecoma capensis.—A rampant *evergreen* shrub or climber. The flowers are orange-red and blossom in clusters throughout the greater part of the year. Useful alike for a shrubbery, arbour or even when grown as a big bush.

SHRUBS—DWARF VARIETIES

Acalypha macafecana.—Hardy *evergreen* shrub with beautiful red-bronze foliage. Of dwarf habit; thrives and looks its best in a sunny position. Admirable for the front line of a shrubbery where it can be seen to advantage if planted either as single specimens or in groups. Can be used for house decoration if grown in tubs or even flower-pots. Withstands a certain amount of frost. Easily propagated by cuttings planted during the spring and rains. Should be pruned hard in April. If "pinched" in October-November the colour is improved and the cold withstood better. Should be used in all shrubberies.

Doedalacanthus nervosus.—A handsome *evergreen* shrub of dwarf habit. Bears pretty blue flowers towards the end of winter. Looks its best in the front

line of a shrubbery facing East or South. Should be used in clumps of 4 or 5 plants—planted 2-3 feet apart—to secure effect. Is particularly effective if grown in front of *Acalypha tricolor* or alongside *Russelia floribunda*. Hardy and withstands a certain amount of frost. Should be pruned back to 12 inches in April. Easily propagated by cuttings and seed.

There is another variety, *Doedalacanthus roseus*, which is not so well-known, that bears pretty pink flowers. It is equally useful and ornamental as the blue variety.

Russelia floribunda.—Quite distinct from *Russelia juncea*. Of graceful habit and particularly suitable for the front line of a shrubbery facing East or South. Bears small, bright red flowers in great profusion at all seasons. Contrasts delightfully with *Doedalacanthus nervosus* near which it should be planted. Useful for big vases for house decoration. *Evergreen*. Should be pruned hard in April. Propagated by division.

Meyenia erecta.—Hardy *evergreen* shrub which bears beautiful purple flowers along the stems during the summer months. The plant has a graceful habit and is very easily propagated by cuttings. There is another variety which bears white flowers.

Polygonum racemosum chinense.—Free growing. Bears bunches of pretty and cheerful white flowers during spring. Very attractive in the front row of a shrubbery if planted in clumps. The foliage assumes a pretty bronze shade in the winter, if grown in a sunny position. There are ornamental species of *Polygonum* worth trying on the margin of ponds. Adversely affected by frost. Should be pruned right back in April. Propagated by division and cuttings.

Lantans Sellowiana.—Is a drought-resisting, compact dwarf shrub. Very suitable for the front line of a shrubbery. *Evergreen*. Easily propagated by cuttings and seeds in March-April. Bears small, mauve coloured flowers almost throughout the year. Exceedingly delicate and beautiful. Should be pruned in April.

Lantana coccinea (orange crimson), *Lantana alba* (white), *Lantana mutabilis* (reddish fawn). These varieties of *Lantana* are *evergreen*, dwarf in habit, drought-resistant, rapid in growth and most floriferous. Very effective during the monsoon.

(The four varieties of *Lantana* described above should not be confused with the variety *aculeata* or *camara*, which is a strong-growing rampant climber bearing orange-red flowers. This variety is by no means suitable for use in ornamental gardens as under good conditions of growth the plant becomes rampant and uncontrollable).

Russelia juncea.—An exceedingly beautiful *evergreen* dwarf shrub of spreading habit. Bears pretty tubular shaped scarlet flowers throughout the year. Very effective in the front line of a shrubbery. Easily propagated by cutting and division. Makes a charming hanging basket.

Arundinela brasiliensis.—A dwarf, *evergreen* grass that bears pleasing flowers almost throughout the year. Can be used effectively near water or in the front of a shrubbery.

Spiroea corymbosa.—A handsome *evergreen* shrub of dwarf habit, with hawthorn-like flowers, which blossom in March and April. Suitable for the front line of a shrubbery.

Plumbago capensis.—Small *evergreen* shrub ; likes a cool and sheltered place. Very hardy but is adversely affected by frost.

There is another variety, *Plumbago roseus*, which bears pink flowers of a beautiful cerise shade. It can be used very effectively in contrast with the blue variety.

Barleria.—Dwarf, free-growing, compact shrubs. The tubular flowers are most profusely borne in autumn. There are distinct varieties bearing blue, rose, and white striped, yellow and white flowers. *B. cristata flava* is a new Hybrid with bright crimson blooms and is attractive. A very useful class and very fine when grouped.

Hypericum cernuum.—A round, compact, *evergreen* shrub, of moderate size and fair vigour. The dainty yellow flowers are always blossoming, more especially during the cold weather.

Eranthemums (Love Flowers).—There are several varieties with foliage ranging from deep purple to pale-yellow. *Evergreen* and effective when planted in large clumps. Useful for pot plants. Adversely affected by frost.

CHAPTER IV—HEDGES

HEDGES play an important part in gardens, either as an integral part of the formal lay-out or as screens to hide unsightly features such as utility plots, out-buildings, etc. They may also be used with effect in place of compound walls and to demarcate or enclose tennis courts, vegetable gardens, etc..

Whatever the purpose the hedge is intended to serve, there are plants suited to the occasion, but it is important that the right varieties are selected if the hedges are to prove a success both from a utility and ornamental point of view.

In the earlier chapter on planning, reference has been made to the principal uses to which hedges can be put. The uses may be classified briefly as follows :—

- (1) Hedges taking the place of compound walls.
- (2) Hedges forming part of a formal lay-out.
- (3) Hedges to be used for screening purposes.

The local Council regulations generally prescribe that walls must be erected to demarcate and enclose the site of a compound. If, however, it is permissible, a hedge combined with a wire fence can suitably and economically be planted to take the place of a compound wall. The correct procedure, in such cases, is first to erect a suitably strong and high wire (barbed, if desired) fence along the boundary. The hedge is then planted immediately below the line of fence.

As the hedge grows and develops, it will hide the fence and should prove both useful and ornamental. The best hedge for this purpose is undoubtedly *Inga dulcis*, the next being *Duranta plumieri*. If the seeds are sown or plants planted in three or four rows, an almost impenetrable hedge 3 to 4 feet wide can be cultivated.

For formal treatment, the most suitable varieties are *Inga dulcis*, and *Acacia modesta*. Both varieties can be cultivated and maintained for many years without becoming scrubby even when clipped to a height of six or eight inches. *Duranta* should be used for this purpose in places that experience severe frost.

Acalypha marginata also provides a highly ornamental hedge if grown in a situation where it is not unduly exposed to night frosts.

For screening purposes, the varieties already mentioned will answer the purpose. Another suitable one is *Clerodendron inerme*, which is a rambler climber and can be trained on strongly supported wires to form a perfect hedge screen up to 12 feet in height. *Clerodendron* is drought-resisting and has the added advantage of being cattle proof.

In addition to the varieties already mentioned, *Prosopis juliflora* and *Thevetia nerifolia* can be used for screens or rough hedges where little or no irrigation is available. They form good hedges if kept clipped or they may be allowed to reach their full size and habit if a rough tall screen is desired. *Thevetia* will show the effects of drought during the dry, hot weather if on a dry, hard soil, but revives with the first shower of rain. *Prosopis* will thrive on the driest of soils throughout a prolonged drought without showing any ill effects, retaining its dark green foliage under the most adverse conditions. Both are cattle proof and may be planted in the most exposed situations without risk of damage.

For temporary use and quick effect, *Sesbania oegyptiaca* (Jaint or Shivri) is very useful.

The best time for planting hedges is between

February and April, but the sooner the seed or cuttings can be put down the better.

As with all hard-wooded plants, success depends largely on thorough and adequate ground preparation. Shallow trenching can only result in slow and weak growth and increased water consumption. Allow a width of two feet for a dwarf hedge and three feet for a hedge intended to be grown to a height of 3 feet or more.

After the alignment has been nicked in the ground (*dagbelled*) or otherwise marked, about 6 inches of surface soil should be removed and the exposed surface trenched to a depth of two and a half feet. If the soil is good, the surplus earth removed may be spread over any unprepared portion of the garden, *e.g.*, vegetable gardens or lawns, where it will prove beneficial.

To ensure that digging is done properly the process described on pages 36 and 37 may be followed.

After the trenching has been finished, 3 to 4 inches of well-rotted stable manure or compost manure or sifted city sweepings should be spread on the bed and well mixed with the upper 15 inches of soil. The surface should then be roughly dressed and the bed irrigated thoroughly. The surface should afterwards again be carefully levelled and dressed so as to ensure proper watering after planting.

It is necessary that trenching is deeply and evenly carried out, for variations in depth will result in marked differences in growth and that symmetry and neatness of growth so necessary in dwarf hedges can never afterwards be obtained, no matter what degree of care and attention is given to future cultivation. Ample watering space should be left, a minimum depth of 4 inches being advisable.

If the soil is alkaline or otherwise unsuitable for plant life, the bad surface soil should be removed to a depth of at least 18 inches. The exposed surface of the bed should then be trenched to a further depth of 18 inches and sweet earth (to a depth of 12 inches)

and stable or compost manure (to a depth of 3 or 4 inches) should be added. The whole should then be well mixed and copiously watered before planting or sowing.

The cost of preparation of hedges in the different methods described above can be worked out by applying local rates to the following quantities :—

For a hedge 100 feet long.

Good soil.	Dwarf hedge 2' wide	Tall hedge 3' wide	Alkaline or bad soil.	Dwarf hedge 2' wide	Tall hedge 3' wide
1. Removal of surface soil 6 inches ..	100 c.ft.	150 c.ft.	1. Removal of surface soil 18 inches ..	300 c.ft.	450 c.ft.
2. Trenching 30"	500 c.ft.	750 c.ft.	2. Trenching 18"	300 c.ft.	450 c.ft.
3. Stable or com- post manure 4 inches ..	60 c.ft.	90 c.ft.	3. Sweet earth 12 inches ..	200 c.ft.	300 c.ft.
4. Cost of seed or cuttings.			4. Stable or com- post manure 4 inches ..	60 c.ft.	90 c.ft.
			5. Cost of seed or cuttings.		

It is desirable that the preparation of the bed as described above should be completed by the end of January so that sowing and planting can commence as soon as the weather permits.

It will be seen from later notes on species that some varieties are propagated by cuttings and others by seed.

• Cuttings can be planted in February, while the first week of March is the best time for sowing seed. It is an interesting fact that should be remembered that seeds sown just before full moon produce better germination and growth than those sown after full moon. Plants are hardier and more drought-resisting if raised from seed sown at site, as the primary roots then remain undamaged and, by penetrating at once deep into the subsoil, require less water and are not so liable to be influenced by varying degrees of soil moisture during the ensuing hot weather as those trans-

planted from seed beds or pots, which are largely dependent on lateral surface roots.

The seeds should be inserted in two (three or four for wide hedges) parallel rows, six inches apart and with a spacing of 3" between the seeds. Care should be taken to see that the lines are kept straight and to ensure this it is best to demarcate the lines before commencing work. If seed is plentiful it is a good practice to sow double the quantity required and then thin out to the required distance when plants are about 4 inches high.

In any case, in order to allow for failure of germination of seed and for subsequent losses, it is necessary to have a reserve of seedlings. These should be propagated in the nursery and transplanted to 3 inch pots and kept in readiness for transplanting as needed.

Young hedge plants raised from seed sown at site in late March will begin to need frequent attention in May with the garden shears. Do not be too impatient to acquire height quickly as this can only be done at the expense of base growth, in which case a perfect hedge cannot result.

• When the plants reach a height of 6 inches, they should be topped with the garden shears back to within 4 inches of the ground. This will cause the formation of several lateral growths on each plant, which should in turn be topped in the same way, and so on, as growth goes on, the hedge gaining height by gradual stages of three inches or so and at the same time acquiring strength and solidity of bulk. In this way a solid compact hedge is secured in the minimum time.

If left to grow unchecked from the commencement, the hedge will always possess a thin, untidy base and if clipping is left for longer intervals there is considerable waste of energy in growing longer growths which would otherwise go towards the production of laterals and thus aid the process of thickening.

• Water deeply once a week while the dry, hot weather lasts and make good all deaths as they occur from

stock grown for this purpose. White ants, rats and other plant pests will invariably account for a number of seedlings and if stock is not available in pots for their replacement and the grower is dependent on seed, uniformity of growth will be lacking, as it will take considerable time for newly-raised seedlings to reach the height and strength of the older plants.

* Where white ants are particularly troublesome, keep the soil thoroughly wet by frequent irrigation and sprinkle the trench occasionally with a mild solution of copper sulphate or phenyle. White ants dislike wet conditions, while copper sulphate and phenyle, although not absolute preventives, will further help to hold them in check.

Instructions about the propagation of hedge plants grown from cuttings are given in the later notes concerning each variety and in Chapter IX (4).

Regular watering, clipping and constant cultivation of the surface soil complete the treatment required for the proper upkeep of hedges. At intervals of 2 or 3 years a surface dressing of well-rotted stable manure can, however, be given with good results.

A brief description of the varieties of plants that can be commonly used for hedges is given below :—

Inga dulcis (The Madras Thorn) is in fact a medium-sized tree. It tolerates clipping, however, and is perhaps the most perfect of dwarf hedges. It is seen at its best when cultivated to heights of from one foot to three feet. Once established it is hardy, requiring only normal irrigation and regular clipping throughout the growing season. It is one of the most lasting hedges and even when kept clipped to a height of one to one and a half feet will remain neat and compact for many years if given reasonable treatment. Its main drawback is its liability to the attacks of white ants while in the young stage, for the first 18 months or so. After this, as the plants harden and become woody, they become immune to these pests

and apart from the risk of impregnation by the lac insect, which only occurs at rare intervals, and if there are lac-bearing trees in the near vicinity, a neat compact hedge is assured for the next 30 years. Attack by the lac insect is easily checked if discovered in the initial stage by syringing the infected parts with a thin solution of ordinary white lime and copper sulphate. The lac usually makes its appearance during the spring and at the commencement of the rains, and at these periods a close watch should be kept, for once well established it is difficult to eradicate and soon causes severe damage to the infected plants. The seed of this plant is plentiful and easily procurable and the best and hardiest hedges are those raised from seed sown at site. The plant prefers an open situation and does not thrive in the shade of trees.

Acacia modesta (Phulai) is also a small, drought-resistant tree that tolerates clipping. It is of similar habit of growth and requires much the same treatment as *Inga dulcis*. It is slower and more drought-resisting and forms an extremely pretty hedge with fine mossy foliage which takes on pretty copper and red tints in the spring as growth becomes active and new foliage forms. In common with most *Acacias* the seed possesses an extremely hard coat and to ensure quick and regular germination it is necessary to soak it in cow manure for several days before sowing, or, alternatively, the seed may be placed in hot water and left to soak for 24 hours immediately previous to sowing. While undergoing this process the seed should be frequently examined and with the first signs of swelling removed from the water and sown direct into the ground. In a very open situation, where exposed to night frosts, *Acacia modesta* sheds a portion of its foliage during mid-winter, but this is more than compensated for by the beautiful appearance of the hedge in the spring when its pretty mossy-looking foliage assumes all shades of red and green, making it easily the most ornamental of garden hedges.

Acalypha marginata forms a good, highly orna-

mental dwarf hedge if given reasonable opportunities in the way of ground preparation and a situation where it is not unduly exposed to night frosts. *Acalyphas* can best be raised from cuttings and, as those planted at site are difficult to look after, it is better to plant them in nursery beds where there is good water supply and shelter from hot winds. The cuttings should be made from well-ripened wood and should be about 8 inches apart so that each plant may be lifted with a good ball of earth when transplanted to form a hedge at the commencement of the rains. Winter wood is firm and well ripened and generally suitable for cuttings, and if cuttings are taken and inserted in the spring, the success should be fully 90 per cent.

Its drawbacks are that it requires copious irrigation and is therefore unsuited to dry positions or where water for irrigation is scarce or expensive; also it is sensitive to frost and should only be used in sheltered situations. In spite of these disadvantages it deserves to be more freely used on account of the colour it introduces.

Acalypha hedges, whether from rooted plants or cuttings rooted at site, will require more individual treatment till the plants are thoroughly established and are more or less on the same footing. Some plants will remain less active than others and those that are quick to establish themselves and send up vigorous growths at short intervals should be dealt with by means of the pruning knife. Hot dry weather is not conducive to rapid growth in *Acalypha*. They love a high degree of atmospheric humidity and the rains is the season they enjoy. They will require nothing in the way of severe pruning or clipping till in vigorous growth about three weeks after the monsoon has set in.

As the cold weather sets in, *Acalypha* hedges will commence to slacken in growth but here and there vigorous shoots will appear and outgrow the rest. These should be treated individually and cut back to normal and not left till a mild general clipping is necessary. This plant will now commence to assume its

rich winter colouring, and defoliation by pruning should not be done to excess or the best cold weather display of foliage will not be obtainable.

Duranta plumieri is also propagated from cuttings and thrives in the shade of trees or buildings and is chiefly reserved for shady situations where other hedge plants cannot succeed. In shade spots the cuttings may be planted at site and are best made from well-ripened wood of a thickness of about half an inch. As there will probably be a few failures, it is advisable to provide for this by planting a number in nursery beds for transplanting as required. As in the case of other hedge plants, deep and regular trenching is essential but in a good garden soil manure is not really necessary unless unusually rapid results are required. For hedgework the blue-flowered type is the best, being the stronger and generally more vigorous than the white variety and not so liable to attack by red spider in a dry season.

Clerodendron incrme may either be raised from cuttings made from the soft terminal wood and planted in early spring or by detaching side-growths with a small amount of fibrous roots from the parent plants.

Of the two methods the latter is the quicker, if sufficient plants are available, as by this means sturdy plants may be obtained for hedge-planting in about three months from the commencement of propagation. The side-shoots should be detached in March, cut back to about six inches in length and planted in four-inch pots and kept in a shady, sheltered position for a month. As growth progresses they should be gradually exposed and hardened; and by the end of June they will be ready for their permanent positions.

Planted at the commencement of the rains, *clerodendron* will form a dwarf compact hedge $1\frac{1}{2}$ feet high by the end of the growing season. Its advantages are that it is drought-resisting and cattle-proof, for not even goats will browse it. Unfortunately it is susceptible to frost, if planted in an exposed situation and

although the damage sustained is purely temporary, recovery is not effected till warm weather sets in; thus there is the drawback of a blackened hedge for several weeks at a period when neatness and good appearance are most desired.

Naturally, *Clerodendron* is a rambling climber and on this account can be put to a variety of uses. Trained on firmly supported parallel wires, it forms a perfect hedge screen and can be taken to a height of 12 feet, provided the supports are strong enough to sustain the pressure of high winds during dust-storms and late monsoon gales. It may be trained over dry barren slopes or old walls and unsightly buildings and, being absolutely cattle-proof, may be planted safely in situations where other plants could not exist.

Dadonia viscosa (Indian Boxwood) which is a hedge plant commonly grown on the plains, forms a good hedge for three years or so and for this period in shape and general appearance is all that can be desired. From this age it becomes very sensitive to an excess of root-moisture during the humid monsoon months, and plants commence to die out here and there, causing unsightly gaps which cannot be satisfactorily filled, as the older the hedge becomes the greater the fatalities during the rains; interplanting with young plants only brings about a patchy, irregular appearance which, once started, goes on indefinitely. On this account *Dadonia* should be regarded as a temporary hedge, capable of lasting well for a maximum of 3 years. Hedge plants should be raised from seed sown at site, if possible, and not raised in small pots for transplanting as is sometimes done.

Sesbania aegyptiaca (Jaint or Shevri) is a soft-wooded, short-lived, herbaceous shrub, 6 to 10 feet high, with numerous spreading branches. Leaves are pale green. The shrub grows very fast, stands pruning well, and makes an excellent hedge or wind-break. It is propagated by seed and may be sown throughout the year but the best results are obtained

from sowings in the spring. Is only suitable for use as a temporary quick hedge or screen and should not be used where a permanent hedge is required.

CHAPTER V—TREATMENT OF GARDENS WITH INADEQUATE WATER SUPPLY

OCCASIONALLY one is faced with the task of maintaining a garden on an inadequate or a highly expensive water supply and it is generally only possible to afford sufficient water for lawns, shrubs and plants occupying the more important positions in the scheme of planting. Or it may be that the compound is too large to attempt to garden completely.

Under such conditions it is not necessary to neglect altogether the distant backgrounds for there are a number of large shrubs and dwarf trees available which are suited to dry conditions and once established in normal seasons require no further attention as regards irrigation. The effect they produce cannot compare with a choice selection of ornamental shrubs and dwarf trees but a pleasing aspect may be obtained by bringing them into use and unsightly views of distant outhouses and other objectionable features thus obliterated.

Cheaply constructed winding paths which will provide a complete tour of the garden will add considerably to the interest in this portion of the garden. The curves in the paths should be planted with shrubs and tall growing objects that hide the view beyond and thus introduce an element of surprise.

The different varieties of trees and shrubs should be massed in large groups and given a good start by thorough and deep trenching. It is not necessary to trench throughout the area they occupy. Holes 4 feet square by 4 feet deep, for trees, and 3 feet square by 3 feet deep for shrubs, constitute sufficient ground preparation and if well rotted stable manure or compost manure is added to a depth of 4 inches, initial growth will be much accelerated.

If the soil is alkaline or otherwise unsuitable for plant life, the bad surface soil should be removed to a depth of at least $1\frac{1}{2}$ feet. The exposed surface of the holes should then be trenched to a depth of $2\frac{1}{2}$ feet to $1\frac{1}{2}$ feet as necessary and sweet earth (to a depth of 12 inches) and stable manure (to a depth of 4 inches) should be filled in each hole and well mixed. The holes should be completely watered on two or three occasions before actual planting.

The cost of the work can be calculated by applying the local rates to the following quantities:—

Planting in good soil.		Planting in alkaline or unsuitable soil.	
Per tree.		Per tree.	
1. Excavation & refilling 4 ft. \times 4 ft. \times 4 ft. ..	64 c.ft.	1. Excavation & removal 4 ft. 4 ft. $1\frac{1}{2}$ ft. ..	24 c.ft.
2. Stable or compost manure, 6 inches ..	8 c.ft.	2. Trenching. 4 ft. \times 4 ft. $2\frac{1}{2}$ ft. ..	40 c.ft.
3. Cost of tree ..		3. Sweet earth 12 inches ..	16 c.ft.
		4. Stable or compost manure, 6 inches ..	8 c.ft.
		5. Cost of tree.	
Per shrub.		Per shrub.	
1. Excavation & refilling 3 ft. \times 3 ft. \times 3 ft. ..	27 c.ft.	1. Excavation & removal 3 ft. \times 3 ft. $1\frac{1}{2}$ ft. ..	14 c ft
2. Stable or compost manure, 6 inches ..	$4\frac{1}{2}$ c.ft.	2. Trenching 3 ft. 3 ft. $1\frac{1}{2}$ ft. ..	14 c ft.
3. Cost of shrub.		3. Sweet earth 12 inches ..	9 c ft.
		4. Stable or compost manure, 6 inches ..	$4\frac{1}{2}$ c ft.
		5. Cost of shrub.	

After constructing the paths and planting trees and shrubs, the ground should be cleared of all debris and carefully dressed. The effect will be very gratifying and in course of time the ground, benefiting from water that will percolate from the trees and shrubs, will become fit to grass.

In moist sandy soils a small creeping plant of the Verbenaceae family, named *Lippia nodiflora* (vernacular—Bakkain or Vakkain), makes an excellent lawn and does not require as much water as grass. It keeps a new green if the mowing machine is regularly used to cut off the small white flowers.

The following varieties of trees and shrubs are well adapted for use under the conditions described above:—

TREES

Acacia arabica (Kikar).—Height 50 to 60 feet; almost evergreen; a shapely tree generally; drought-resistant and valuable economically.

Acacia auriculiformis.—An evergreen handsome tree with eucalyptus-like leaves and yellow flowers. Rapid growing.

Acacia farnesiana (Valayati Kikar).—An American species of *Acacia*; is a small tree well known for the small globose clusters of yellow flowers borne in the cold weather. It is thorny and quick growing. Very useful for making long boundary hedges. Has a delightful perfume and is cultivated in the south of France for this purpose.

Acacia modesta (Phulai).—Almost evergreen. A medium-sized, drought-resistant tree. When pruned it forms a good boundary hedge. Flowers small and white in the beginning of the hot weather. Further particulars of this tree will be found in the chapter on Hedges.

Bauhinia Triandra (Koiral).—Evergreen. Height 40 feet; moderately drought-resistant and fairly fast in growth; beautiful when the rosy purple flowers blossom in late autumn. A very fine compact tree.

Butea frondosa (Flame of the Forest—Dhak).—Deciduous; height 30 feet to 35 feet. Habit low and spreading, foliage broad, dense and handsome. A glorious sight when wreathed in its orange scarlet blossoms.

Bischofia javanica (Andrikni).—Almost evergreen; height 50 to 60 feet; habit round, free and compact;

foliage dense deep green. A moderately moist soil is necessary. A splendid shade tree.

Caesalpinia cororaria (Divi Divi or Libi Libi).—A medium-sized tree; habit round and spreading. Foliage feathery and graceful. Bears insignificant pale yellow flowers in the hot weather. *Almost evergreen*.

Cassia fistula (The Indian Laburnum or Amaltas).—A medium-sized, *almost evergreen*, drought-resistant tree. The tree is conspicuous in the hot weather when the bright yellow flowers appear in long pendulous bunches. Very hardy and ornamental.

Cordia myxa or *obliqua* (Lasoora).—A medium-sized, *deciduous tree*. Crown rounded and shapely. It produces edible fruit which is insipid. Drought-resistant.

Cordia sebestena (The Scarlet Cordia or Aloe-wood).—Dwarf, *evergreen* tree with gorgeous orange scarlet blossoms.

Crataeva nurvala (The Sacred Barna).—There are several distinct species grouped under this name. A small *deciduous* tree with smooth pale grey bark and white, pale yellow or reddish-yellow flowers. Growth is slow and protection from cattle is necessary. Very handsome when in flower in April or May. *Deciduous* during the cold weather.

Erythrina indica (Indian Coral Tree).—A moderate-sized, *deciduous* tree reaching 60 feet, with a straight trunk and numerous branches. The branchlets are armed with small prickles up to the third or fourth year. The flowers which are large and numerous, of a bright dazzling scarlet, growing in a single or in several racemes at the ends of the branchlets, appear before the leaves and are arranged in clusters. Flowers from February to May.

Erythrina parcelli is a variegated form of *Erythrina*. It is ornamental and thrives in a moist climate. Bears orange coloured flowers. *Deciduous*.

Ficus infectoria (Pilkhan).—*Deciduous*; one of

the ornamental figs, producing a large shapely crown clothed heavily with dark green leaves which assume crimson tints before falling and when in new foliage.

Gliricidia maculata (Madre tree of South America).—A small, elegant and quick growing tree with arching branches and feathery foliage, somewhat like the *Cassias*. Strikingly beautiful in bloom when its branches are covered with masses of pinkish purple or pale pink flowers. *Deciduous*. Flowers in February and March.

Inga dulcis (The Madras Thorn).—A medium-sized tree or tall shrub of quick growth and beautifully delicate foliage. Is much attacked by white ants in the young stage but once established it is very hardy. Further particulars will be found in Chapter IV. *Evergreen*.

Kigelia pinnata (Sausage Tree).—A medium-sized tree of vigorous shapely habit, with curious maroon coloured flowers. Not browsed by cattle but requires shade and moisture. *Deciduous*.

Melia azedarach (Bakain).—*Deciduous*; height 30 to 35 feet; drought-resistant; well treated it is very rapid in growth and a very shapely small tree. Its lilac blossoms are profusely borne and very pretty.

Moringa pterygosperma (Horse Radish Tree).—*Deciduous*; height 30 feet; habit erect, foliage feathery and graceful. The roots and seeds are used as a substitute for horse radish.

Eucalyptus citriodora.—The glistening cream-coloured, shaft, which rises to a height of 80 to 90 feet, is crowned by a light airy head of delicate leafage. A most graceful tree when grouped or standing alone. The leaves are lemon-scented. (From Australia).

Eucalyptus rostrata.—(The Red Gun of Victoria).—The most suitable of the large variety of *Eucalypti* that thrive in India. *Evergreen* and quick-growing. Excellent as specimens in extensive lawns.

Parkinsonia aculeata (Wilayati Babool).—A small

tree or a large shrub; very useful as a hedge plant. Leaves very small; flowers bright yellow.

Pongamia glabra (Papar).—A medium-sized, *nearly evergreen* tree. Drought-resistant. Useful as an ornamental and shade tree. In some places the leaves are disfigured by round grey spots caused by an insect which mines in the leaf, eating the green tissue. When so affected the tree is unsightly.

Prosopis juliflora (Mesquite Bean).—A tall shrub or dwarf tree with beautiful dark green mossy-like foliage. Habit low and spreading. Drought-resistant and growth very rapid. *Deciduous* in cold weather in very cold climates. Cattle-proof. Further particulars in Chapter IV.

Spathodea campanulata (The Scarlet Bell or Fountain Tree).—The *Spathodeas*, of which there are two or three species, are handsome *evergreen* trees with large pinnate leaves and a very showy orange-red or scarlet flowers. Tall and erect, it grows to a height of 70 feet and attains fine proportions when it has not to contend against high winds. For scenic planting in extensive grounds, this is one of the finest trees. It thrives well up to an altitude of 4,000 feet and is suited to districts where the rainfall is not too great. Flowers generally during the cold weather, particularly in February and March. Easily propagated from root suckers or from cuttings. Native of tropical Africa.

Tecomella undulata.—A small tree or shrub, with drooping branches and greyish-green foliage. Flowers large, from pale yellow to deep orange. Very handsome when in full bloom and really worthy of cultivation. It is easily propagated from seed or cuttings. Drought-hardy. Flowers between February and April. Greedily browsed by cattle.

Thespesia populnea (The Bendi Tree).—The tree reaches a height of 30-50 feet, its numerous branches forming a heavy spreading crown of close-set foliage. The tree is *evergreen* and the pale lemon-yellow blooms with a deep maroon centre are very

beautiful. The tree flowers throughout the year but particularly at the beginning of the cold season.

Further particulars of some of these trees will be found in Chapter II.

SHRUBS AND CLIMBERS

Adhatoda vasica (Adoolsa).—Tall shrub, flowers white with a red streak in the throat. Tropical Asia.

Cassia alata (Ringworm shrub).—Flowers deep yellow. Tropical Asia. Very similar in habit to *Cassia glauca* but with more delicate foliage.

Cassia glauca.—*Evergreen*; attaining 8 to 12 feet height. It flowers during various months of the year, principally during the cold season.

Clerodendron aculeatum.—Leaves opposite, narrowed at both ends. Flowers white. Indigenous to tropical America. Useful as a hedge plant, but seldom used as such. Height 5 to 10 feet.

Clerodendron glaucum.—A tall, erect, rampant shrub with narrow lanceolate leaves. The white flowers are borne on the points of the tall growths.

Clerodendron inerme.—Naturally, *Clerodendron* is a rambling climber and on this account can be put to a variety of uses. Trained on firmly supported parallel wires, it forms a perfect hedge screen and can be taken to a height of 12 feet, provided the supports are strong enough to sustain the pressure of high winds during dust-storms and late monsoon gales. It may be trained over dry, barren slopes or old walls and unsightly buildings and, being absolutely cattle-proof may be planted safely in situations where other plants could not exist. Its advantages are that it is drought-resisting and cattle-proof, for not even goats will browse it. Further particulars will be found in the chapter on Hedges.

Cryptostegia grandiflora (Valayati Vakundi or Chabuk Chhuree).—A large climbing shrub, bearing large trumpet-shaped flowers, pinkish mauve in colour. The latex, which is abundant in the stems and parti-

cularly so at the base of the follicles, contains rubber of good quality. Flowers during the rainy season, July-September. It grows well in pure sand in Jaipur, Rajputana, with rainfall of about 20 ins. The plant is drought-resistant and cattle-proof.

Flacourtia sepiaria.—A large *evergreen* shrub. The foliage assumes beautiful purplish bronze tinge in January. An excellent plant for grouping and drought-resistant.

Ipomea cornea.—A vigorous climber that thrives in poor soil and is almost perpetually covered with masses of mauve-pink flowers. Excellent for the outer garden.

Lantana alba (white) *Lantana coccinea* (orange-crimson), *Lantana mutabilis* (reddish fawn).—These varieties of *Lantana* are *evergreen*, dwarf in habit, drought-resistant, rapid in growth and most floriferous. Very effective during the monsoon.

Lantana sellowiana is a drought-resisting compact dwarf shrub, very suitable for the front line of a shrubbery. *Evergreen*. Easily propagated by cuttings and seeds in March-April. Bears small, mauve coloured flowers almost throughout the year. Exceedingly delicate and beautiful. Should be pruned in April.

Malvaviscus S. P. (Turkish Cap).—A strong growing floriferous shrub which has numerous crimson flowers resembling a Turkish cap in shape.

Nerium odoratum (Oleander).—A hardy, *evergreen* shrub of upright habit, bearing both double and single flowers almost throughout the year. The single flowering varieties are the most satisfactory to grow, particularly the white, pink and deep red varieties. Drought-resisting.

Poinciana pulcherrima (Barbadoes Pride).—Often referred to as the Gold Mohur Shrub. It is, in fact, often confused with the Gold Mohur. The flowers are very similar to those of the Gold Mohur and the plant remains in bloom practically throughout the summer months. Very suitable for a summer flowering shrub.

bery. Another variety has pure yellow flowers and is very striking.

Prosopis glandulosa.—A strong-growing, drought-resisting, *evergreen* shrub; height 10-15 feet.

Schinus terbinthifolia.—A tall hardy shrub, with aromatic leaves. Very suitable for the back line of a shrubbery where its dark green foliage affords an excellent background for smaller varieties. Should not be pruned too hard; needs only to be trimmed in April as circumstances dictate. Propagated by cuttings but more easily raised from seeds in March. Can be effectively used, along with Fiddlewood, for breaking the sky line of a shrubbery. *Evergreen*.

Tecoma capensis.—A rampant *evergreen* shrub or climber. The flowers are orange-red and blossom in clusters throughout the greater part of the year. Useful alike for a shrubbery, arbour or even when grown as a big bush.

Thevetia nerifolia.—A hardy, compact *evergreen* shrub. The most common variety bears deep yellow bell-shaped flowers but other colours are available. Looks well in isolated clumps. Will thrive with similar treatment as for *Prosopis*. See Chap. IV.

Tecoma stans.—A tall, erect shrub that bears clusters of yellow flowers almost throughout the year. Suitable for the back line of a shrubbery. Very hardy but, unfortunately, the foliage is apt to turn yellow during the cold winter months. Should not, for this reason, be used in smaller shrubberies. Should be pruned hard in April. *Evergreen*. Flowers throughout the year.

CHAPTER VI—LAWNS

THERE is perhaps no branch of gardening so simple and yet so neglected in India as the proper construction and maintenance of grass lawns. It is common to see otherwise really good gardens spoiled by patchy, irregular lawn growth, when adherence to a few simple

rules in planting and maintenance would ensure a good, well-covered lawn surface.

The only conditions under which a good grass surface is unattainable are under constant shade, whether from buildings or trees, on an alkaline soil, or where the water supply is inadequate and only sufficient for shrubs and other ornamental plants.

Even where the last named condition prevails, much can be done by careful surface modelling and levelling so that each grass plot forms a catchment area and no part of the rainfall is wasted by being permitted to drain off, and by constant and regular hand-watering when there is no rain.

For tennis courts, golf greens, etc., where a superfine quality of turf is required, years of practical experience in the management of such surfaces and adequate facilities in the way of water, manures and labour are necessary to get the desired results, but the construction and management of ordinary garden lawns is well within the capabilities of most amateur gardeners provided they can afford to meet the expense of carrying out the initial turfing in the correct way and of the subsequent cost of maintenance, the degree of which depends largely on local conditions and the amount of interest and care exercised by the owner.

The construction of garden lawns may be taken in hand any time during the hot weather provided irrigation is available, and during the rains provided about two and a half months of growing weather is left to enable the turf to form a good surface before cold nights set in and activity of growth ceases. Generally the growth of grass ceases after October in places where the winter is severe.

In cases where irrigation is carried out by lift from wells or is from a filtered water supply the cost must necessarily be considered and the best advantage taken of the rains, but where irrigation is effected by

canal water or by unfiltered water supply this consideration does not arise and under such conditions the most suitable time for lawn making is during the hot weather when good planting material is available and work is not liable to be held up through the soil being rendered unworkable by heavy and incessant rain.

The first essential in lawn making is thorough and adequate ground preparation ; if this is not done no amount of after-care will produce a good grass surface.

In the first place, surface levels must be considered and whether irrigation is carried out by means of wells, canal, filtered or unfiltered water from a pipe system or if little or no irrigation is possible, it is always advisable to keep the surface about 2 inches below the levels of garden paths and drives, raising the margins by sloping them a few inches to form a neat turf edge about $1\frac{1}{2}$ inches high.

In this way adequate irrigation can be carried out right up to the margins without waste of water through spilling on to paths and all rainfall is conserved and evenly distributed, thus considerably reducing the labour and cost of artificial irrigation. If the mistake of keeping the lawn levels above the level of paths and drives is made, as is frequently done, adequate irrigation is impossible, roads and paths are flooded and valuable rainfall, which would otherwise do much to minimise the cost of watering by artificial means, is wasted. Not only is the grass affected, but the trees and shrubs planted about the area are also heavily handicapped, the light, purely superficial waterings obtainable being insufficient to penetrate deep enough to be of real benefit to deeply rooted plants. When need exists in places where the rainfall is heavy, arrangements can be made for the drainage of the lawns in accordance with the procedure described in the Chapter on Drainage (page 148).

Rough surface levelling should be done before trenching and then the whole area dug through to a depth of 18 inches, irrespective of whether the surface varies

through patches of cutting or filling brought about in the course of rough levelling.

If, however, the ground is low lying and it is necessary to fill imported soil to any appreciable extent, the depth of trenching may be reduced by the depth of filling. This will help to keep down the cost.

The method of digging described in the chapter on Shrubs at pages 36 and 37 is both economical and efficient. Particular care should be taken, however, to see that all large earth clods are well smashed up as they are dug. It is the mali's habit to leave this till the digging is finished, with the result that only surface clods are broken, those lying below the surface escaping untouched and providing innumerable unfilled spaces between them into which soil gradually washes as irrigation proceeds, causing surface subsidence for months and vastly interfering with and retarding the process of grass culture.

All hard substances, such as old masonry and other refuse which may have been dumped, must be entirely removed. Where old foundations or similar material is encountered it should be removed to a minimum depth of 3 feet; otherwise a variable surface growth will result through retarded capillary action.

If the soil is alkaline, the procedure will be somewhat different. Excavate and remove as much of the alkaline soil as necessary to reduce the level of ground to about a foot below the level of paths and drives. Then trench the soil to a depth of 9 inches or so and add about 9 inches of imported good soil.

Trenching and/or filling completed leave the soil to dry for at least a week or more if possible. Then turn the soil again and roughly smooth down the surface and check and see if the mean level is correct throughout the area. If not, correct this by moving soil as required. Then apply a good dressing

of two to three inches of finely screened nightsoil manure, compost manure or old stable manure and dig in to a depth of 8 inches or so. The next step is to bring about thorough soil settling by flooding with water. Bank up round the margins to a height of 8 inches and, if facilities exist, flood the whole surface to a depth of 6 inches. The flow and lodgement of the water will clearly indicate unevenness in the surface. These areas should be marked and, as soon as the soil is dry enough to work, the ground should be roughly levelled by removing soil from one place to another as necessary. After the rough levelling has been completed, the ground must be finally levelled. For this purpose, it is necessary to have a sufficient number of level pegs 12" in length with pointed ends and 2" square at the top, a straight plank about 8' 6" long and 4" wide and a spirit level. A mark should be scored or painted on each peg 6" from the top. Starting from the centre of the lawn drive in pegs up to the 6" mark in straight parallel lines keeping a distance of 8' between the pegs and between the lines. In this way put down 3 to 5 lines of pegs. Now again starting from the centre line place one end of the plank on one peg and the other end on the peg next to it in the same line. Place the spirit level on the centre of the plank and check the level from the position of the bubble. Drive in or lift the outer peg until the bubble is in the centre of its run. Proceeding in the same way from peg to peg get the level correct of the centre line of pegs. Then working from these pegs to the adjoining pegs in the adjacent line get the levels in that line correct. After the pegs have all been fixed at the correct levels, earth should be removed to disclose the mark on those pegs on which it is hidden. After this proceed very carefully with surface levelling by stretching a string from peg to peg and seeing that the surface is made parallel to it in all directions. This operation needs excessive care and the employment of labour that is trained to this class of work. It will be found

best for this purpose to use small slats of wood about 18" x 3" x 1" in size.

After work on the area covered by the 3 or 5 lines of pegs has been finished, the inner pegs may be removed and refined in lines working outwards from the last line of checked levels. Work on levelling should proceed as before until the whole area of the lawn is finished.

After this has been done it is advisable again to flood lightly the surface and as soon as dry enough re-check the levels. It will usually be found that slight surface settling has occurred here and there and these shallow depressions should be filled in before grass planting is commenced. Then extract the level pegs and all is in readiness for turfing.

The cost of preparing a lawn in accordance with the above directions can be worked out by applying the local rates to the following quantities:—

Area of lawn—say, 1,000 sq. ft.

In good soil.		In alkaline or unsuitable soil	
(1) Rough levelling and trenching 18 in. ..	1500 c. ft.	(1) Excavation and removal of bad surface soil 1 ft. ..	1000 c.ft.
(The process recommended is much cheaper than excavation and filling)		(2) Trenching throughout 9 inches	750 c ft
(2) Finely screened stable manure, compost manure, or night soil manure, 3 inches ..	250 c ft.	(3) Sweet earth 9 inches ..	750 c.ft.
(3) Levelling and dressing finely	1000 sq ft	(4) Finely screened stable manure, compost manure or night soil manure, 3 inches	250 c ft
(4) Cost of planting grass roots or sowing seed (½ lb.) including in the latter case about 25c.ft of leaf mould ..		(5) Levelling and dressing finely	1000 sq.ft.
		(6) Cost of planting grass roots or sowing seed (½ lb.) including in the latter case about 25 c.ft. of leaf mould ..	

There are three usual methods of turfing in India. The most commonly used variety of grass is *Cynodon dactylon* (Haryiali or doob).

As previously stated in the chapter on Trees, *doob* grass will not thrive under the shade of trees. In lieu of *doob* grass it is necessary in shady places to cultivate the annual winter grass (*poa annua*) and the small yellow flowered oxalis. These plants require moisture and this can be obtained by slightly reducing the surface level under trees.

The first and most generally used method of turfing is planting or dibbling grass roots; another method is sowing lawn grass seed; and the third and least used method is chopping up the roots and stems or rhizomes of grass, mixing this with soil and liquid cow dung (*gobar*) using sufficient water and taking care that the roots are thoroughly crated. The mixture should be spread over the surface after moistening the soil and then covered with about half an inch of dry soil.

The third method should be discarded as it is slow and unsuitable in dry and variable climates and is often more expensive than planting by dibbling.

For the first method (*i.e.*, dibbling or planting) the grass selected should be well ripened and short in texture with close nodes or joints. Long, sappy grass procured from shady situations or as is formed during the rains, is unsuitable as it has little stamina. The nodes being far apart, it forms less root and a considerable time lapses before it becomes at all vigorous in growth. If long sappy grass only is available, it is better to avoid surface growth for planting purposes and to rely entirely on the underground stems.

Planting should be carefully watched to see that the *mali* plants deep and does not just slide the *kurpa* beneath the surface as he will do if allowed, this method being quicker and easier than making strong vertical thrusts for deep planting. For quick results the grass tufts should be planted 3 inches apart.

After planting is completed, pass a *very light* roller over the surface and irrigate lightly at short

intervals if no rain occurs. Subsequent cultivation will consist of mowing, weeding and irrigation, processes which are described later under the directions for maintenance.

If it is desired to establish a lawn from seed, the best seed of *doob* grass should be procured from a reliable firm. Poor seed will give unsatisfactory results and retard the establishment of the lawn.

Lawn seed is very fine and the greatest care in sowing is necessary in order to prevent wastage and unequal distribution and uneven germination of seed. Birds and ants also take a heavy toll and seeds are often sown too deep.

If the following instructions are carefully followed, the results should be most gratifying.

The ground should be initially prepared for turfing as previously described. The area should then be well watered and a fine dressing (about $\frac{1}{4}$ inch) of soil, consisting of an equal mixture of finely sifted leaf mould and sweet earth, should be spread evenly over the surface. The dressing should be smoothed down with light lissom bamboo rods; the *mali* prefers to use these to the garden rake at which he is a poor hand. A generous allowance is one pound of seed to one hundred and fifty square yards.

Choose a still day for sowing the seed and, if possible, select a time before full moon. Seed sown within two days of full moon produces better germination and stronger growth than that sown at any other time. The worst results are obtained from sowing before new moon.

Mix the seed with an equal quantity of river sand, or, if this is not available, with an equal quantity of finely sifted sweet soil.

In order to ensure that the seed is completely and evenly sown, stretch two garden lines across the prepared ground, three or four feet apart, and sow the seed between these lines; then refix the lines to

cover the adjoining 3 or 4 feet of ground and so on until the whole ground is sown.

After sowing, water lightly with watering cans with fine flat sprays, as used for seed beds. When the ground is dry enough to permit it, pass a *very light roller* over the surface to settle the soil and thereafter water at regular intervals with watering cans with fine sprays, keeping the surface continuously moist.

The seed should begin to show signs of germination within 3 weeks. Some seed will germinate well in advance for no apparent reason and it is not unusual for germination to be delayed for six weeks or so.

After germination subsequent cultivation will consist of mowing, weeding and irrigation, as in the case of lawns planted with roots.

When the growth of grass, whether started from seed or roots, has progressed sufficiently to require the lawn mower, the first trouble experienced will probably be a rank growth of *motha* (*Cyperus*) which springs up on freshly dug, irrigated ground and which, in the early stages, is apt to smother and retard the growth of *doob* grass. Its habit of growth and methods of reproduction make its complete eradication practically impossible, but, fortunately, steady work with the mowing machine soon reduces it to a semi-dormant state and the *doob* grass assumes the upper hand.

The first heavy crop of *motha* should be dealt with by hand weeding, each growth being cut about $1\frac{1}{2}$ inches below the ground surface with a narrow, sharp weeding *khurpi*. By the time it reappears the *doob* growth and the lawn mower will keep it in check and after a few weeks, except on close inspection, it will not be noticeable. A good deal of labour is often wasted by the inexperienced in attempting the complete eradication of *motha* from grass areas, but such attempts must necessarily end in failure and considerable waste of money.

Before the first mowing is done, the lawn should be rolled with a *very light roller* to depress pebbles or

other small hard substances, which watering may have washed on to the surface, into the soil and prevent them damaging the knives of the mowing machine. Except for this one rolling, the roller should be entirely discarded as its use only serves to callouse the surface, a condition to which *doob* grass strongly objects, as it retards the spreading action of its growth and encourages soil sourness.

If it is desired to obtain a superfine surface, it is necessary, at this stage, to apply a dressing of $\frac{1}{4}$ " of finely sifted clay and river silt, pre-mixed in a proportion of 1:2. This dressing which should be applied shortly after irrigating the lawn, should be spread and smoothed down. Small slats of wood about 18" \times 3" \times 1" in size should be used for this purpose.

While growth is spreading and filling up above the surface, light mowing frequently should be done, the machine knives being kept fully one inch above ground level. Close mowing, resulting in excessive defoliation, is harmful and retards progress by considerably weakening the turf. Hand weeding should be done at short intervals.

Lawn weeds will freely appear while the turf is thin and unestablished and must be dealt with before they have time to seed. The most troublesome, the *dudi* (*Euphorbia thymefolia*) produces seed when quite small which, if allowed to ripen and fall, will be the cause of much trouble and expense.

As regards irrigation, moderation is the point to observe. The somewhat common belief that the heavier the irrigation, the better the grass growth, is erroneous. Over-watering leads to loss of lime salts, resulting in soil acidity, and must be avoided if a fair quality of turf is to be attained.

Many are inclined to make excessive use of the roller with the idea of improving surface levels and also in the belief that because English lawn grass improves by frequent rolling the same applies to *doob*.

A greater fallacy never existed. In the first place the roller will never to any appreciable extent correct faulty surface levels, and, secondly, its continued use has a most damaging and retarding effect on *doob* growth. The habit and method of growth of *doob* is entirely different from that of English lawn grass. The former has little fibrous roots and spreads both above and below the ground surface by means of creeping stems and rhizomes which produce root fibre and foliage at their nodes or joints. The harder and more calloused the ground surface through excessive rolling the more this spreading action is restricted and, for this reason, the use of the roller should be studiously avoided till a good substantial grass covering has been attained.

A lawn planted and established in accordance with the directions given above will last and give excellent results for many years, provided mowing, weeding and irrigation are regularly done.

When the morning dew is heavy it is beneficial and conserves irrigation if the dew is worked into the lawn with light lissom bamboos or a light wooden roller.

One important point to remember in connection with upkeep is that rapid thickening of the turf cannot be expected during the rains as the spreading habit of *doob* is checked during this season, the tendency being towards vertical growth. While this condition lasts, the knives of the lawn mower should be raised in order to keep plenty of foliage on the turf and enable it to contend with excess moisture.

Towards the end of September the machine knives should be dropped and the grass should be kept as close as possible to the ground surface by continuous close mowing. Anything approaching long growth is energy wasted and should be guarded against from September onwards.

The preceding directions govern the preparation of lawns on which it is possible to start work in the

hot weather or rains, in time to secure a good winter effect.

It not uncommonly happens, however, that for one reason or another it is not possible to start the planting of grass till it is too late in the season for newly planted *doob* grass to establish and look well in the winter.

In such cases an extraordinarily good effect can be obtained by planting *Trigonella* which is a local variety of clover.

The ground selected for the permanent lawn should be dug up, levelled, manured and planted with grass roots, as described for permanent lawns. On the completion of these operations, *Trigonella* seed may be scattered thickly about the surface and covered with about $\frac{1}{8}$ inch of finely-sifted soil.

The thick, luxuriant green growth that will ensue in about a month, if the seed is sown before the weather becomes too cold, can be mown and kept trim in the same way as a grass lawn, and will last until the middle or end of March, afterwards drying off with the increasing heat, leaving the turf in far better condition than if planted alone. The trouble involved is well worth while as flower beds, groups of shrubs, etc., can then be shown off to better advantage.

In addition to the ordinary treatment of mowing, weeding and watering of lawns previously described, it is necessary periodically to treat lawns with lime and chemical manures.

Few amateurs realize the importance of an annual liming on grass surfaces. It is particularly necessary where intensive manuring is done or where regular irrigation is carried out. Lime is an essential plant-food, and is necessary as an aid to soil nitrification. A soil deficient in lime is a dead soil, and at least one annual liming is necessary for all grass surfaces.

Two applications in the year will do no harm and will keep conditions well on the safe side: the first at

the commencement of the rains and the second at their termination when irrigation is recommenced.

A simple test of the existence of lime is as follows.

Take some samples of soil from the grassed area and thoroughly mix them together. Fill a glass tumbler two-thirds with the mixture of soil and add enough water to make a thin paste. Then pour in a small quantity of hydrochloric acid. If it effervesces freely, lime is present in good quantity; but if the chemical reaction is slight, lime is deficient and its application is necessary.

Further instructions on this subject will be found in the chapter on Liming. (page 216).

Lime should not be applied in conjunction with farmyard or other nitrogenous manures.

Just before the monsoon, a stock of unslaked lime, calculated at the rate of one maund for every 5,000 sq. ft. of turf should be purchased and stored in an open shed till required. It should be well watered and turned once a week in order to thoroughly slake and sweeten it before use. As soon as the monsoon starts or in early July, the lime should be applied. Choose a still day and damp the lime slightly before application. It is not necessary to exercise too great a care as regards regularity in distribution as lime once washed below the surface soon adjusts itself in the soil.

At the end of the monsoon when the lawn mower knives are lowered and close mowing commenced, an application of ammonia sulphate or nitrate of soda will prove of great benefit in stimulating the final and most valuable growth which takes place before the advent of cold nights practically brings the growth of grass to a standstill.

Of the two manures mentioned, ammonia sulphate is preferable as it is more stable in the soil and less liable to wastage by careless watering or heavy rain. It must be borne in mind, however, that with the use of this manure regular liming is necessary. The lime should have been applied sufficiently in advance

to be completely washed into the soil. To apply sulphate of ammonia with lime lying exposed on the surface is pure waste as the ammonia is at once set free and goes off as gas into the atmosphere. In addition to its value as a fertilizer sulphate of ammonia helps in the eradication of weeds. Grass prefers fairly acid soil conditions while many weeds do not. Sulphate of ammonia produces such a reaction in the soil and favours the growth of grass, at the same time discouraging the development of unwanted weeds. Even more important than this, however, is the fact that the ammonium in sulphate of ammonia has been definitely proved to be toxic to many common lawn weeds, so that its action as a weed-eradicator is two-fold.

With the use of sulphate of ammonia and nitrate of soda, very careful after-watering is necessary as the hose left running on one spot for any length of time will wash the manure on to surrounding areas, thus depriving some spots and concentrating the manure on others, causing a marked difference in growth of the turf.

Ammonia sulphate should be applied at the rate of $\frac{3}{4}$ lb. per 100 sq. ft.

It is best put on in solution ; and experience has shown the following procedure to be the quickest and simplest method of application and at the same time it ensures even distribution ; a most essential point with powerful chemical manures, as irregularity in application is afterwards marked by differences in growth in the area treated.

The articles necessary for small garden areas are two garden lines about 100 feet long, two 10-foot bamboo rods, an empty tin measure for the ammonia sulphate and two four-gallon water cans fitted with coarse sprays. Fine sprays will cause considerable trouble and delay work owing to continuous blocking of the holes with coarse material contained in the manure.

Stretch the garden lines across the grass area ten

feet apart and lay the bamboos transversely across them at a distance of ten feet apart, thus enclosing an area of 100 square feet. Dissolve $\frac{3}{4}$ lb. of ammonia sulphate in $3\frac{3}{4}$ gallons of water—it is not advisable to have the cans quite full—and sprinkle it evenly over the enclosed space. Then move the first bamboo ten feet in front of the second and repeat the process until the full area has been covered. A four-gallon watering can will suffice for 100 sq. ft. If smaller watering cans are used, the proportion of ammonia sulphate should be adjusted accordingly. A kerosine oil tin contains 4 gallons and an empty one furnishes a ready measure.

The soil should be thoroughly moist when the manure is applied and on completion the area should be given a light watering.

The effects will be visible after about 10 days, when regular irrigation may be resorted to. It should be remembered it is of little use applying this manure during the rains as growth at this period is of small benefit to the surface and the chemical is speedily dispersed and washed away, if heavy falls occur shortly after application. It should be left till risk of heavy rain is over and the growth it stimulates is of a character that will benefit and help to form a good quality of turf.

About a fortnight after the application of the ammonia sulphate, a lime dressing will be most beneficial and serve to counteract any surface soil acidity occurring through excessive moisture. A light dressing of well-slaked lime at the rate of 1 maund per 5,000 sq. ft. will be sufficient.

If funds do not permit of annual treatment with artificial manure and lawns are found to be exhausted and unduly troubled with weeds, the following treatment, which should be carried out before or during the rains, is recommended.

The grass should not be mown for some time and weeds should be removed as far as possible.

The ground should then be watered freely and

the soil, when soft, should be opened up and the surface aerated to a depth of 2 to 3 inches. If the soil is not too stiff this can be done by long-toothed hand rakes, the teeth of which have been previously sharpened, or by a "turf-prodder."

If the soil is too stiff and hard to aerate as above, it should be deeply cultivated. For this purpose a garden fork is necessary. The fork should be plunged straight into this ground to the full length (10" or so) of the prongs in lines 3 or 4 inches apart. The fork should be pressed forwards and backwards once.

Following the treatment described above and after some days of exposure to the sun, a dressing of $\frac{1}{2}$ " of well rotted cattle manure or compost manure or decayed city sweepings should be given. The manure should be finely sifted before being applied and smoothed down with small slats of wood. This method of dressing is better than using a rake, which the *malis* can seldom handle.

In order to prevent offensive smell and fly trouble and to provide a more finished surface the manure may be covered by a fine dressing of $\frac{1}{4}$ " of finely sifted clay and river silt in a proportion of 1:2 which should be applied in the same way. Care should be taken to avoid the use of soil which may contain the seeds of weeds.

If the ground was well watered previously, no irrigation should be necessary till the grass is well through and the surface stabilized.

In the case of large areas of lawn it will be preferable to aerate the surface thoroughly by harrowing it. If a harrow cannot be obtained, a simple one can be devised by driving stout nails into the underside of a small wooden sleeper. The nails should be driven in in two or three parallel lines about 3" apart each way and about $1\frac{1}{2}$ " to 2" of the nails should be left protruding. At the time of using the harrow, a man should stand on the upper side of it so as to provide the necessary weight to tear up the surface. The harrow should be cleared as necessary. *Doob* grass

is very deep-rooted and, surprisingly enough, it will suffer little by the treatment described.

After harrowing, the surface should be scraped and cleaned of all roots and stems and the soil left exposed to the sun for some days. The area should then be roughly dressed and levelled. After a few days rest it should be finally treated with a dressing of manure and soil in the manner previously described.

If lawns have been allowed to deteriorate to an extent that weeds predominate and a sufficient quantity of *doob* grass as a base to work on is absent, the only remedy is complete renewal and this should be carried out as early in the year as possible.

All efforts should be made to complete the work before the end of May, as the longer the period of growing weather left after completion, the better the surface attained by the commencement of the following cold weather, after which time practically nothing can be done to improve growth.

If the surface to be regrassed is weed covered, first scrape off (the *malis* call it 'cheel') all surface growth and completely remove the upper $\frac{1}{4}$ inch of soil in order to get rid of seed which is lying there awaiting favourable conditions for germination. This will save a large amount of after labour in weeding as a quantity of seed is always left sufficiently near the surface to permit germination if the upper $\frac{1}{4}$ inch of soil is not first removed.

After this has been done, the ground should be completely trenched, dug throughout to a depth of 18 inches and otherwise prepared as described for newly made lawns.

The subsequent treatment for turfing will be similar in all respects to that followed in the case of new lawns. It will be useless and only a waste of money to follow any half measures.

The instructions for the upkeep of lawns will not be complete without reference to the troubles that have to be faced in maintaining good grass surfaces.

These troubles may be broadly classified in three categories, *viz.*, (1) pests, (2) weeds, and (3) foreign grasses.

The principal pests to be dealt with are ground weevils, ants and field rats.

The ground weevil burrows into grass surfaces and nightly throws up small mounds of earth. When organic manures have been freely used, an excessive number of worm-casts often appear on the surface and cause considerable trouble as they must be allowed to dry and be broken up before either the roller or mowing machine is used ; if this is not done, the surface becomes covered with hard nodules which are later difficult to eliminate.

The nuisance may be considerably reduced by sprinkling heavily with a lime solution at dusk. This will have the effect of bringing the worms to the surface, from where they may be collected and removed at daybreak.

Another method of treating worm-casts is to mix about a dessert spoonful of phenyle in a pail full of water so as to make the water slightly milky; spray this mixture through a watering-can over five or six square yards ; the worms will appear above the surface, when they may be collected. The solution will not injure the grass.

A more effective way of dealing with the trouble is by blowing Cymag powder down the holes by means of a pump, specially designed for this purpose. Cymag is a fine powder which evolves hydrocyanic acid gas on exposure to the moisture in the air.

Field rats and troublesome ant colonies may be dealt with in the same way. The dry gas powder is harmless if handled carefully, but the gas generated on its coming in contact with soil moisture is highly injurious to human beings and its use should only be entrusted to a capable and reliable man.

Particulars of Cymag and its uses may be had from

any firm dealing in chemicals, which will also supply the necessary pumping apparatus.

Still another method of dealing with ground weevils and ants is by the use of Seekay Soil Fumigant, a patent chemical compound in the form of a dry meal or factice. It is safer and more convenient to use than Cymag.

Where field rats are the only trouble they may be exterminated in a simpler way by blowing smoke down their runs. For temporary use, all that is required is an earthen *chatti* and a pair of country bellows. A hole to fit the nozzle of the bellows is made in the side of the *chatti* which is filled with dry combustible material, green neem leaves and a sprinkling of sulphur powder. The material is first ignited and when burning well the *chatti* is inverted with its mouth over the entrance to the run. The smoke is forced through the runs by vigorous use of the bellows and either drives out the rats in a stupefied condition, when they are easily dealt with, or suffocates them in their burrows. Simple as the apparatus is, it is very effective and may be used safely by the ordinary garden labourer.

A weed, according to the gardener, may be defined as a plant that is growing where not wanted, to the detriment of cultivated plants, either adversely affecting their growth or their general appearance as garden ornaments.

The chief point to remember is that, although unfiltered water, dust-storms, manures, etc., will regularly introduce weed seeds, the plants are seldom difficult to deal with if a careful watch is kept and they are promptly weeded out, but should a period of neglect occur through indifference or any other cause, the case assumes a different aspect. The whole lawn area becomes impregnated with seed and thousands of seedlings appear, endangering the *doob* growth and necessitating the introduction of special labour and methods to deal with them effectively.

In this particular line the *mali* is of little assistance; his one method of dealing with all weeds is to chop them off at ground level and leave the plants lying on surface until their seeds have dried and fallen, thus doing more harm than good by failing to deal effectively with the parent plants, and materially aggravating matters by distributing their seeds about the garden.

The weeds with which lawns are principally troubled are *Dudi* (*Euphorbia thymefolia*), a red weed; *Gobi*, a composite with a small daisy-like flower; and *Trigonella* (Clover). The last named, which has previously been recommended for use for temporary effect, is easy to deal with. This springs up in lawns about the beginning of November as soon as a favourable mean temperature for seed germination is reached. It remains in active growth until about the middle of March and then dies off with the increasing heat, having first matured and deposited its seed on the ground surface. There the seed remains dormant throughout the hot weather and the rains until the favourable period for germination again arrives, when the crop produced is on a larger and far more extensive scale than that of the preceding year. Being an annual with shallow fibrous roots, a hard scraping (*cheeling*) of all vegetation at ground surface after the seed has germinated and before fresh seed matures—usually about the middle of February—will dispose of the existing crop for good; although a few scattered seedlings introduced by the various agencies mentioned before will spring up the following winter, they can easily be disposed of in a few minutes as they can be plucked out by hand without the aid of the *kurpa* or other garden tools.

The *Gobi* has a long vertical fleshy root stock which bears buds almost along its entire length. The only remedy for this, once the plant has developed and established itself, is regular and deep severance of the root stock as far down as the weeding *khurpa* will go. It will form laterals and re-appear but if dealt

with again immediately and not allowed to foliate on the grass surface it will gradually weaken and finally die of suffocation.

By far the most troublesome of lawn weeds is the *Dudi* or red canal weed. It lies flat on the ground surface, thus escaping the lawn mower when other taller growing weeds are regularly decapitated and their seeding activities thus kept in check. It remains in active growth practically throughout the year and once well established soon overruns and chokes the *doob* grass. When present in large quantities its eradication by hand weeding is slow and expensive and the best remedy is to turn over the lawns to the grass cutters, thoroughly clear the surface of all growth, afterwards brushing off all loose earth and adding a top dressing of old night soil which has been pitted for several years and is beyond suspicion as regards the possibility of its containing active seeds of lawn weeds. Even this drastic operation will not be entirely effective. A few seeds will have been left behind and these must be disposed of as soon as the ground plants appear or there is a risk of the operation having to be repeated.

One final word. It should be remembered that strong growing grass is itself the best preventative against weeds. If, therefore, the grass is well planted and kept in vigorous growth, there will be comparatively little trouble from weeds.

In addition to weeds, it is necessary to keep a sharp watch for foreign grasses which germinate freely and grow apace during the hot weather months. Being thoroughly at home in hot, humid conditions, they outpace and overrun the *doob*, and, if neglected, will speedily ruin what otherwise may have been a good turf surface.

The most troublesome of these are the *Ingen*, *Jirga*, *Motha* (*Cyperus*) and *Useer* grasses.

The *Ingen*, apart from being a good monsoon fodder grass, has nothing to recommend it. It is of extremely rapid and strong growth while the rains last

but at the end of the season it ripens and drops its seed and dies off, leaving bare ugly spaces from where it has ousted the *doob*. It is fibrous-rooted and easily dealt with by hand-weeding if taken in time; but, if allowed to remain and seed, it becomes extremely troublesome and can only be eradicated at considerable expense and damage to the lawn.

The *Jirga* somewhat resembles *doob* in habit above ground, only that it is coarser in texture and its flower stems are longer and more conspicuous, standing up 18 inches high and being freely produced at all seasons of the year. Where a fine type of turf is required, it must be rigorously kept down, which is not difficult as it is surface-fibrous-rooted and entirely dependent on its seed for reproduction.

Motha (Cyperus) has previously been referred to in the instructions regarding preparation of lawns. A rank growth springs up on freshly prepared and irrigated lawns which in the early stages if not removed is likely to smother and retard the growth of *doob* grass. Its habit of growth and method of reproduction make its complete eradication practically impossible but fortunately steady work with the mowing machine keeps it sufficiently in check.

With an unfiltered water supply, the *Useer* grass frequently appears in lawns, although it may not be present anywhere on surrounding areas. It is distinguishable by its broad, stiff leaf blades and silvery white flower spikes borne on slender, straight stems. Once having effected an entry, it rapidly spreads by means of underground rhizomes and soon overruns the lawn grass. Attempts to dispose of it by digging out the rhizomes, which penetrate 8 inches or a foot below the surface, are rarely effective as a small scrap of rhizome left in the ground is sufficient for re-impregnation. Moreover, patchy digging on lawns upsets levels and is generally unsatisfactory.

The best way of dealing with this lawn pest is by suffocation. It is a grass that can only grow in the open, away from shade, and completely loses its vi-

tality if light and air are excluded for a short period. Of the various materials tried as a means of excluding light and air, ordinary burnt bricks have proved the most successful and easy to handle. The infected patches must first be well watered as the operation will not be entirely successful if carried out on a dry surface. The bricks are then laid as close as possible over the *Useer* patch, the area bricked extending about 2 feet beyond the outer plants. This needs to be carefully watched for round the mass of the *Useer* growth there is always a scattering of isolated growth sent up by the ramifying rhizomes from beneath the surface, the method by which this lawn pest spreads, and, if these are not dealt with, it is of little use smothering the main mass of growth.

The joints between the bricks should then be filled with mud made up of a moderately stiff soil. Clay should not be used, as this cracks on drying and the covering does not remain air-tight. If done at the commencement of the hot season, the covering should be left in position for 6 weeks and, if during the rains, one month is sufficient.

At the end of these periods, the *Useer* will be dead and the *doob*, though considerably weakened, will soon recover, if given ordinary encouragement. For a time, it should be allowed to grow at will and gain strength and afterwards gradually reduced by use of the lawn mower.

CHAPTER VII—FLOWERS AND FLOWERING PLANTS

Give fools their gold, and know their power ;
 Let fortune's bubbles rise and fall ;
 Who sows a field, or trains a flower,
 Or plants a tree, is more than all.

Song of Harvest

(I) CLIMBERS AND CREEPERS

‘ORNAMENTAL climbers play an important part in garden decoration and a selection, with due regard to

their flowering period, will add considerably to the show of colour throughout the year. Climbers may be put to a variety of uses, *e.g.*, for covering bare walls, trellis work, pergolas and old semi-decayed trees; for isolated groups on lawns and as additions to the colour scheme in shrubberies. The strength and habit of growth of the different species need to be carefully considered with regard to the positions they are to occupy because with the majority of kinds frequent pruning, to keep them within bounds on a restricted area, means corresponding loss of bloom and colour, the beauty of the plants thus never being fully developed.

Again, immediate environments play an important part from the point of view of temperature. Thus, kinds which are really best adapted to the monsoon months may be encouraged to bloom throughout the cold weather, if given the warmth and shelter of a south wall, where they are protected from the cold north-west wind, and have the benefit of heat radiation from the masonry during the cold, winter nights. Others prefer cool semi-shaded positions and are at their best when allowed to ramble at will over old trees or on the east side of a tall building. Whatever the use and the nature of the situation may be, there are climbers to suit it.

There are a very large number of varieties and specimens of climbers to be found in India. Particulars of these which are mainly of interest as a collection are available in nursery catalogues and price lists. It is proposed to confine the remarks in this chapter to a few varieties which are notable for their masses of bright glowing colours or for their foliage effects and which give a more or less all-the-year effect. A descriptive list of climbers is given at the end of the chapter but before turning to the list it will be an advantage to study the following notes describing the use to which the different varieties can most suitably be put. It should be remembered that, as the majority of the more ornamental kinds of flowering climbers are very strong and vigorous growers, it is sometimes

difficult to restrict growth sufficiently to form ideal specimens for bungalow walls, the plants showing to better advantage where they can ramble unrestricted over old trees or spacious pergolas.

Classification in three broad categories will afford a useful guide for small gardeners.

- (1) Climbers suitable for bungalow walls or other limited areas of masonry where the plants must be kept strictly within limits
- (2) Climbers suitable for pergolas and other similar structures where space is less restricted than in (1), and
- (3) Climbers requiring more or less unrestricted space for development.

It is also desirable to distinguish further between (a) varieties that require the shelter and warmth of a southern aspect or south wall and (b) those which benefit from a cool, shaded position.

CATEGORY (1).—*Climbers suitable for restricted areas such as bungalow walls, etc.*

(a) Varieties that prefer a southern aspect and benefit from the shelter and warmth of a south wall.

1. *Antigonon leptopus*, *insignia* and *alba*.
2. *Banisteria laurifolia*.
3. *Bignonia venusta*.
4. *Bougainvillea* (Mrs. Butt).
5. *Bougainvillea* (Louis Wathen).
6. *Clerodendron inerme*.
7. *Ipomoea rubro-coerulea*.
8. *Jacquemontia violacea*.
9. *Quisqualis indica*.
10. *Thunbergia aurifolia*.

(b) Varieties which benefit from a cool semi-shaded position.

1. *Asparagus racemosus*.
2. *Banksian* and other climbing roses.
3. *Bougainvillea laterita* and other delicate flowering varieties.

4. *Ficus repens*.
5. *Lonicera sempervirens*.
6. *Lonicera japonica odoratissima* (The Honey-suckle).
7. *Petrea volubilis*.
8. *Rhyncospermum jasminoides*.

Note.—For a dwarf wall, where space is very restricted both in height and spread, the three best subjects are *Ficus repens*, *Rhyncospermum* and *Clerodendron*. The *Ficus*, by means of small claw-like adventitious roots, clings closely to the masonry in the same way as the ivy; while the last two may be kept regularly clipped with the shears without showing marked deterioration.

CATEGORY (2).—*Climbers suitable for pergolas and other similar situations where space is less restricted than in (1).*

(a) Varieties that prefer a south aspect and benefit from the shelter and warmth of a south wall.

1. *Allamanda Grandiflora*.
2. *Antigonon leptopus*, *insignia* and *alba*.
3. *Banisteria laurifolia*.
4. *Bignonia venusta*.
5. *Bignonia gracilis*.
6. *Beaumontia grandiflora*.
7. *Bougainvillea splendens*.
8. *Bougainvillea* (Mrs. Butt).
9. *Bougainvillea* (Louis Wathen).
10. *Jasminum pubescens*.
11. *Quisqualis indica*.
12. *Tecoma australis*.
13. *Tecoma capensis*.
14. *Tecoma radicans*.
15. *Thunbergia aurifolia*.

(b) Varieties which benefit from a cool semi-shaded position.

1. *Banksian* and other climbing roses.
2. *Bougainvillea laterita* and other delicate flowering varieties.
3. *Lonicera japonica odoratissima* (Honey-suckle).
4. *Lonicera sempervirens*.
5. *Petrea volubilis*.

Note.—Where isolated specimen groups are desired on extensive expanses of lawn, the *Bougainvilleas* are generally useful. *Bougainvillea glabra* is the first to flower, continuing in bloom on and off throughout the hot weather months. *Bougainvillea* (Mrs. Butt), *Bougainvillea splendens* and *Bougainvillea* (Louis Wathen) flower throughout the cold weather and in equable climates almost throughout the year. *Allamanda grandiflora* with clusters of beautiful yellow flowers during the hot weather and rains, *Beaumontia* which produces a mass of lily-like flowers in February, and *Petrea*, a vivid patch of sky-blue in March, are also useful for specimen groups. The three last names require strong 10 ft. supports, preferably of iron, for when fully grown the weight of the plants is considerable and should the supports collapse it is not easy to substitute others without reducing the bulk of the plants.

CATEGORY (3).—*Climbers requiring more or less unrestricted space for development; suitable for covering old semi-decayed trees, abandoned structures, etc.*

1. *Allamanda aubletii*.
2. *Asparagus racemosus*.
3. *Beaumontia grandiflora*.
4. *Bignonia venusta*.
5. *Bougainvillea glabra*.
6. *Cerius triangularis*.
7. *Hiptage madablota*.
8. *Ipomea mexicana*.
9. *Porana paniculata*.
10. *Petrea volubilis*.
11. *Quisqualis indica*.
12. *Tecoma grandiflora*.
13. *Tecoma radicans*.
14. *Thunbergia grandiflora*.

Note.—These varieties are all of extremely rapid growth and in the course of two years will convert an unsightly half dead tree into a highly ornamental garden feature.

The climbers listed above include varieties that flower during different times of the year, and even if choice is limited to the more highly coloured and popular kinds, it is easy to get a rotation of colour from the commencement of the cold weather to well into the beginning of the hot season. The chief difficulty is to find positions where they may bloom and exhibit their colour to the best advantage.

Jacquemontia, *Quisqualis* and *Thunbergia*, which are at their best during the monsoon months, continue

in flower into early winter and are useful for their show of colour at a time of the year when high glowing colour is scarce, being chiefly limited to dwarf, late rainy season annuals. These three for all practical purposes cease flowering as the cold increases, to be followed by *Bougainvillea glabra*, *Porana* and *Antigonon* and temporary creepers such as *Mina lobata*, *Ipomeas*, *Clitoria*, etc., which are purely of a temporary nature and only useful in positions where they will not leave ugly scars when they cease to be of further value at the end of their flowering period. These in turn are followed by other varieties of *Bougainvillea* and *Jasminums* and by *Bignonia*, *Rhyncospermum*, *Banisteria* and *Lonicera*, all of which are highly ornamental.

When dealing with climbers, adequate ground preparation is essential if good results are to be secured. The treatment in this respect should generally be similar to that advocated for trees and shrubs. If left to the *mali*, he will dig small holes at the base of the walls or posts, as the case may be, just sufficient to accommodate the balls of the new plants and leave the rest to chance. In isolated cases, where fortunate enough to strike good, loose soil, the results will be quite satisfactory, but generally the plants will be complete failures, particularly on bungalow walls where they are subjected, in their early stages, to extreme heat from masonry during the dry, hot weather. In such position, where in most cases the plants have to root under hard, consolidated paths, the path material should be removed and pits 4' \times 3' \times 4' deep dug and filled in with good, well-manured soil. The margin of the outer width may be re-covered with path material using an undercoat of coarsely broken bricks before replacing the surface path material so as to reduce the surface area of the pit to 3' \times 2'. Ample depth should be left for watering, for against the hot masonry, leaf surface evaporation is rapid and frequent and copious watering is necessary.

For other garden structures there is less difficulty.

in providing root room for climbers and each plant should be given a pit of well-manured soil at least 4' x 3' x 4' deep with a good surface depression for copious watering.

A word as to wiring on bungalow walls will be helpful. A few wires irregularly tacked on to the masonry are unsightly and inadequate. The creepers cannot be conveniently removed during annual repairs with the result that they receive in a large measure the whitewash intended for the walls. A support consisting of two horizontal $\frac{1}{2}$ inch round iron bars, about 2'-6" to 3' long, the lower one fixed to the wall and the upper laid across bent staples, and 3 or 4 strands of supporting vertical wires is all that is necessary. During annual repairs the upper bar is lifted off the staples, thus bodily removing the climber from the wall and permitting the necessary work to be done without damage to the plants.

As soon as the creepers have been planted they should be copiously watered and trenched at regular intervals. Newly planted creepers will need no other attention during the first year except to see that they are properly tied to their supports as need arises.

Established creepers will need careful attention at the close of the flowering season.

The more robust kinds will need hard pruning but there can be no hard and fast rules for pruning as a great deal depends on strength of growth. Each plant should receive individual treatment taking into consideration its position and growth. In this respect the descriptive notes against each variety may be studied with advantage.

Excessive growth should be thinned out and all dead wood removed from wall and pergola climbers. This should be done in the spring or with the first promise of rain. It is not advisable to do this during the hot, dry weather as the excessive heat from an exposed wall surface or the iron work of a pergola will have a bad effect on the plants.

As soon as the monsoon ends the climbers should be given a final overhauling by thinning out unwanted growth and tying the remainder in position.

After pruning has been completed there should be copious watering until the new growth is well established. If the plants show signs of soil exhaustion, fork in a liberal quantity of manure. The breaking up of the surface at regular intervals throughout the year should not be neglected.

If treatment is continued in this way the climbers will give a handsome return for the trouble spent on them.

It is unlikely that well grown climbers will be attacked by pests such as mildew, white ants, thrips, etc; but if they are, they may be given the same treatment as recommended for roses (see pages 116-117).

During the dry weather there is a risk that red spider will make its appearance. If allowed to remain and spread, the pest will soon denude the plants of their foliage. Examine the under surface of the leaves at intervals and at the first signs of its appearance (it is a minute spider-like insect) syringe heavily at early morning and late evening with clean water, directing the spray well up under the leaves by placing the forefinger over the nozzle of the syringe. Taken in time the pest is easily checked and destroyed as it cannot survive moist conditions; but once allowed to establish itself thoroughly the plants attacked are inevitably ruined.

The following is a more or less choice selection of climbers that can be relied on to produce a good effect in a small garden. A fuller description of some of these and a description of other varieties mentioned in this chapter will be found in earlier chapters of this book.

Allamanda aubletii.—A vigorous climber with bright yellow flowers which blossom freely. Races up trees. Propagated by cuttings.

Allamanda grandiflora.—A large superb *evergreen* shrub of scandent and rambling habit. Flowers large, of bright yellow colour appearing in clusters. The plant is in constant blossom during the hot and rainy season. Can be used as a climbing vine or as a creeping ground cover. It prefers a sunny position and well drained soil with a good supply of water. It is propagated by layers or cuttings of the mature wood. The branches should be well thinned and pruned during the cold season.

Antigonon insigni (rosy pink), *leptopus* (deep pink) and *alba* (white).—*Deciduous*, hardy and vigorous climbers which are particularly charming in autumn when in blossom. Suitable for arbours or other forms of trellis. Unfortunately *Antigonon* presents a very untidy appearance during the winter months and its use should be confined therefore to inconspicuous places in the garden.

Asparagus racemosus.—The indigenous climbing asparagus is very hardy and most vigorous. It is unfortunately bare during a part of the cold season. The long *Asparagus* tails are always useful for cut work. A very fine climber for an old tree trunk.

Banisteria laurifolia.—A handsome *evergreen* climber. The showy yellow flowers blossom in clusters in spring. It should be kept pruned of all strong growing shoots but this treatment will not affect its flowering value, as it blooms from ripened woody growths.

Beaumontia grandiflora.—A vigorous broad-foliaged *evergreen* climber. The big handsome pure white scented trumpet-shaped flower blossoms in spring. Suitable for shrubbery, arbour or wall.

Bignonia gracilis.—Bears yellow flowers which appear several times a year but generally in the hot weather when it is very lovely. Clings to its support by claw-like tendrils and is useful for covering stone-walls. Propagated by seed or cuttings.

Bignonia venusta.—A vigorous climber. The profuse clusters of deep orange-coloured flowers blossom

during the cold days of January and February. The plant then requires protection from frost if in an open position. This bignonia is specially fine when rambling over a trellis or draping an old tree trunk. *Evergreen*.

Bougainvillea (Mrs. Butt).—*Evergreen*. Bears very pretty flowers of a deep cerise colour almost throughout the year. One of the quickest growers and flowers very freely. It is one of the best of the *Bougainvillea* and can be effectively used in shrubberies if supported adequately. The required height and spread can be obtained by pruning which can be done two or three times a year.

Bougainvillea (Louis Wathen).—*Evergreen*. Another very strong growing variety of *Bougainvillea* which bears striking flowers which are reddish orange when they open and fade to a pretty salmon pink. The flowers blend very happily with *Petroea volubilis*. Needs similar treatment to Mrs. Butt.

Bougainvillea splendens.—A strong growing compact variety of *Bougainvillea*. Its showy purple flowers are borne freely in spring. The flowers are somewhat similar to *Bougainvillea glabra* but the latter is more rampant and flowers more freely. *Evergreen*.

Cerius triangularis.—Popularly known as the Climbing Cactus, it is of considerable interest both botanically and on account of its large handsome, sulphur-yellow flowers. It needs little in the way of ground preparation and planted at the base of any large tree, whether semi-decayed or in full vigour, will by means of its adventitious roots, climbs unaided, forming its peculiar triangularly arranged growths among the branches and producing its handsome blooms in April.

Ficus (repens).—A small-leaved *evergreen* climber. The dainty growths cling closely to any cool surface. Shade and moisture are necessary. When clinging to verandah pillars or walls it is very pretty.

Ipomoe mexicana bananox (The "Moon Flower")—A vigorous twiner. The large pure white campanulate flowers open after sundown.

Ipomea rubro coerulea.—The heavenly blue morning glory. Bears wide open blue flowers with white hearts.

Jacquemontia volacea.—A free flowing climber with delicate foliage and pretty flowers.

Jasminum pubescens.—A very compact evergreen climber for wall or tree. The sweetly fragrant white flowers wreath the branches during the cold season.

Lonicera japonica odoratissima (The Honey-suckle).—A vigorous, evergreen flowering twiner. The flowers are pale yellow and fragrant.

Lonicera sempervirens.—A vigorous, almost evergreen twiner. The bright orange red clusters blossom in spring.

Petrea volubilis.—A vigorous evergreen climber. Produces violet blue flowers early in spring. Blends very well with the red and salmon-pink *Bougainvilleas* which flower at the same time.

Porana paniculata (Bridal Creeper).—A vigorous deciduous twining climber, the foliage is broad and lusty and the small paper-white blossoms are borne in profuse masses. The blossoming in the Punjab cannot compare with the profusion in more southern provinces.

Quisqualis indica.—An evergreen, hardy and rapid growing climber. It is constantly blossoming but is specially fine in late summer when decked in its clusters of crimson and rose. Suitable for an arbour, a wall or trellis. *Quisqualis* needs vigorous treatment yearly in the way of thinning of overgrowths and removal of dead wood.

Rhynchospermum jasminoides ("Star Jassamine").—Hardy evergreen with glossy green foliage. Flowers white and highly scented.

Tecoma australis.—A vigorous evergreen climber. The flowers are pale buff, blossoming in spring.

Tecoma capensis.—A rampant evergreen climbing shrub. The flowers are orange-red and blossom in

clusters throughout the greater part of the year. Useful alike for walls, arbours or even when grown as a big bush.

Tecoma grandiflora.—A quick growing deciduous climber clinging to walls or supports by means of aerial rootlets. Flowers large orange-red and tubular, gorgeous when in full bloom.

Tecoma radicans. Similar to *Tecoma grandiflora* but bears bunches of smaller flowers.

Thumbergia aurifolia.—A fast growing climber. Suitable for walls or trees. The flowers are blue in colour and are produced during the cold season.

Thumbergia grandiflora.—A very rapid growing climber. Suitable for walls, arches or trees. The handsome flowers are lavender blue in colour.

(2) ROSES

"A butterfly with golden wings broad parted, nestling a rose, convuls'd as though it smarted with over pleasure,"

KEATS.

The rose is aptly described as the queen of flowers. A garden without roses, in a locality where they succeed, cannot be regarded as complete.

It has to be remembered, however, that the rose plant is decidedly seasonal and there are times when its appearance is far from pleasing. It has for this reason been previously suggested that the rose garden should, if possible, be isolated.

If space does not permit of a self-contained rose garden, the rose-beds should be fitted into an inconspicuous portion of the main garden and kept well clear of both shade and flowering plants.

Roses delight in a sunny situation away from the shade and root influence of trees. A sheltered portion where the plants are protected from hot winds and boisterous cold winds, should be selected, if possible. It is not advisable to cultivate other plants such as annual and perennial among roses, as abundance of air is necessary for their growth.

Dwarf Roses are best grown to a formal plan for massed effect, the colours being kept separate or mixed according to individual taste. They should be planted in beds of sufficient area to contain 10 to 25 plants each. These beds should, where space permits, be arranged to a formal design on a lawn. The edges of the beds should be neatly cut in the turf. If the design is made to include an ornamental pool or a central feature such as a sun dial it will be found most gratifying. A self contained rose garden should include suitably spaced and sited standard plants and should be framed by climbers grown on pergolas, pillars or archways. The final arrangement of the garden must of course be a matter of personal taste.

The best all-round type of rose for India is the hybrid tea, but there are a few hybrid perpetuals which are popular and worth growing. When planting do not intermix the two as their habits of growth are quite different. Planted together, the effect is irregular and untidy at all times of the year and if any hybrid perpetuals are selected they should be given a bed to themselves. A fair spacing for hybrid teas is a distance of $2\frac{1}{2}$ feet from centre to centre and for hybrid perpetuals at least $3\frac{1}{2}$ feet. Generally speaking, climbers should not be planted unless full knowledge of their behaviour is available, as all the late flowering kinds which are so beautiful in England fail to bloom owing to the excessive heat later in the season. Climbing varieties of teas and hybrid teas can usually be grown with success on the plains, but this is not the case with a number of the *Polyantha* and *Rambler* type class.

Many *Polyantha* (*Rosa Multiflora*) roses are useful for pot culture and may be tried for this purpose.

Roses in India are too often selected for some delicate shade in colour, which, although fascinating very seldom withstands an hour of bright sunshine. The most easily affected in this respect are the pinks and reds shaded with yellow and orange. The shadings of these are usually spoiled within half an hour

of the opening of the outer petals. To see these at perfection, the buds ready to unfold the first petal should be gathered early in the morning, before the sun gets on them, and allowed to open in a vase placed in subdued light. The shell-pinks are perhaps the next in order in their susceptibility to strong light. The yellows, with a few exceptions, are also bad in this respect.

For general utility purposes, especially where space is limited, a variety with medium to strong growth, which produces a heavy crop of flowers, on long, erect stems, and of a shade which is not easily affected by the sun, should be selected for the main planting. The finer shades should be confined to a plant or so of each in a bed by themselves, as when faded, the ground colour of these is usually not very pleasing.

When possible, the selection should be made from growing plants rather than from a catalogue as it is not usual to list a variety and describe its weaknesses. For the guidance of novices a list of well-tried and worthy roses is given at the end of the chapter. All the varieties mentioned are excellent in every way and would admirably serve the purpose of a small garden.

The varieties that succeed as Standards are marked with an asterisk.

New varieties, however, are being introduced annually, and it is interesting to import half a dozen plants annually from England. It is economical to import in the year following their introduction when the prices are normal and within reach of the small purse. A convenient and economical way to import roses is through friends who may be returning from Home-leave before the winter. Imported in this way they will cost no more than ordinary varieties in India.

Roses will flourish in practically any soil provided it is well prepared and generously treated in the matter of manure and other constituents found wanting in the soil. A rich, loamy soil is the best, especially if a

certain amount of clay is also present. If the soil is of a sandy nature add a fair proportion of clay. This can usually be obtained in the plains from the bottom of tanks or *jheels* during the dry season.

Lime is good for roses especially where the soil is of a retentive nature and it also tends to neutralise injurious acids in soils which have been heavily manured.

A gravelly soil is the worst one can select for roses.

Good drainage is absolutely essential and rosebeds should never be made where rain water lodges for any length of time.

The reason for so many failures among roses may be traced to over-manuring. The soil becomes "rose sick" and the only remedy is to prepare new beds where roses have not been grown for some considerable period.

When preparing rose-beds, remove the soil to a depth of $2\frac{1}{2}$ to 3 ft. Allow the soil to remain on the surface for two or three days to become well aerated by sun and air.

Before returning the soil, place 6 inches of well-rotted cow manure or finely-sifted road sweepings, or better still, compost manure, at the bottom of the beds. It is important that the roots of the plants should not come in contact with manure directly after planting and no more manure should be added when returning the soil to the beds. When the beds are filled to the required height, press the soil firmly with the feet and, if dry, give a good watering. This will settle the soil and prevent subsequent sinking which is to be studiously avoided. The bed should be finally dressed to a depth of about 3" below garden level. The surplus earth, if good, may be spread over any unprepared portion of the garden.

As soon as the soil is in a suitable condition, planting operations may be started.

If the soil is alkaline or otherwise unsuitable for plant life, the bad surface soil should be removed to a

depth of at least 18 inches and replaced by good soil.

The cost of preparation of rose-beds in the manner described above will be almost the same as that of preparing shrubberies, details of which have been given in Chapter III.

In the plains the period 15th October to 15 December will be found to be a good time for planting. The earlier date applies more to the United Provinces and the Punjab; the latter date refers to Bengal and other Southern Provinces. Roses are sometimes transplanted with success during the months of August and September but in this season everything depends on weather conditions. Very heavy rain directly after planting will ruin the plants, while a hot, dry spell will so exhaust them that only those with the strongest constitutions and which have received no damage at the time of planting, will survive.

As roses never become leafless on the plains, the leaves are often removed before packing to prevent excessive transpiration.

On receipt of rose plants by post the parcel should be unpacked in a cool shady place and if the plants appear dry they should be submerged in water, roots and tops, for 24 hours, when each plant should be examined and those that have nice plump wood can be planted but any that still show signs of shrivelled bark should be returned to the water for another 24 hours. After excessive drying it sometimes takes them 2 or 3 days to plump up but they should not be kept in the water longer than necessary. Before planting, the roots should be given a coating of mud mixed with water about the consistency of thick cream and if the beds have been properly prepared, holes need not be made bigger than is necessary to spread out the roots in a downward and natural position. The size necessary for this is about 15 inches deep by about 9 to 12 inches wide. After the roots have been spread properly, fine earth which is not too wet nor too dry, and in which no manure has been mixed should be

carefully run around the roots until the hole is three quarters full. The soil should not be pressed in by hand, but whilst the plant is being held in position by one man another should pour in water with a watering-can until the hole is filled. This will ensure the soil being properly packed round each root and in five or ten minutes' time when the water has soaked away, the remainder of the soil can be filled in up to about 2 inches of the surface and another soaking of water given. The plant can now remain till the following day when the ground becomes dry enough to be levelled and the bed finished off, when a good soaking to the whole bed might be given and after a week or ten days the plants can be pruned back within 6 or 8 inches of ground level.

Roses imported from England usually arrive in a shrivelled condition. Dead roots and shoots should be carefully removed. The plants should be placed upright in a deep trench with their roots well covered with light sandy soil which must be kept moist. The plants should be protected from the heat of the sun by matting or similar material. The plants will show signs of life after 2 or 3 weeks. The plants should then be slowly hardened by gradual increased exposure to the sun. When they appear strongly established, they may be planted out.

English growers usually recommend planting a new rose about 1 to 2 inches below the point where the bud was inserted, the reason being that if the wild stock becomes unhealthy it is possible that roots might be produced by the bedded portion at the point of insertion, in which case the rose would carry on, on its own roots. But in England roses are usually budded much lower than in India and if Indian grown roses were planted below the union of the bud they would be too deep to do more than linger for a few months and then die off. The golden rule in transplanting all trees is to bury the uppermost lateral root 2 inches below the ground surface.

After roses have been planted as described above, periodical watering and cultivation is all that is required

to ensure success, always bearing in mind that water should not be given when not required and not withheld when it is required. As a guide, if the surface soil when moved for a depth of 2" or 3" appears dry or even only moist, water is required, but when the soil is tolerably wet within two inches of the surface, water is not required and does more harm than good. At the same time, frequent light watering will keep the surface wet without penetrating deep enough to benefit the roots, and to guard against this the surface of the bed should always be made 2 or 3 inches below the surrounding ground level. Three or four days after watering the surface of the bed, soil should be cultivated to a depth of 2 or 3 inches but on no account deeper. Otherwise the surface roots which are the principal feeders are destroyed.

During the first two years budded plants throw up suckers of the parent stock very freely and these, being of a freer growth, if allowed to remain, kill the budded portion. Careful watch should be kept for these suckers and they should be cut out as they appear, which will always be below the graft. When removing these growths see that they are detached at the junction with the main stem, for if cut higher up they will form laterals and the loss of energy sustained will be greater than ever. It is not difficult after a little experience to detect the difference between the growth of the stock and the bud; all that is needed is a careful study of the foliage.

All rose plants need pruning at least once a year. This is best done some time during October. Teas and hybrid teas should be pruned back to within 3 to 6 inches of the point to which they were pruned the previous year; 6 inches for the stronger growers and 3 inches for the weak ones. At the same time, all very weak and dead wood should be entirely removed. If pruning is properly done, very little dead wood should be found the following season. Care should be taken to cut back close to a plump healthy eye with a sharp instrument. The cut cannot be made

too close to the eye provided the latter is not injured, and when possible the eye pruned to should be one facing outwards, *i.e.*, away from the centre of the bush, as it is necessary that air and light should penetrate the bush to produce healthy foliage which in turn produces healthy wood, without which good flowers cannot be expected. Over-crowding branches should be avoided and when they are considered too thick for proper development a thinning should be done. Such branches should be cut out with a sharp knife as close as possible to the main branch from which they grow. This thinning can best be done during the growing season to prevent the roots wasting energy in maturing surplus growth. Hybrid perpetuals do not need to be pruned as closely as hybrid teas.

As previously stated, the main pruning should only be done once a year, some time during the month of October, but preparation for pruning should commence a month or so earlier, *i.e.*, all water should be withheld after the last fall of the monsoon. Generally speaking, roses do not require any artificial watering after the monsoon starts. At least one month's rest should be given before pruning and this can be done only by withholding water as far as is necessary.

For pruning purposes there are two kinds of climbers. One is the rambling kind which produces flowers from the bud at the base of each leaf of the previous year's growth, and whatever pruning these get should be done after flowering and should consist only of the removal of dead and very weak branches and shortening back a few of the very strong ones that might have grown out of bounds. The medium-sized healthy branches should not be shortened. If thinning is considered necessary the surplus growth should be taken out from their starting point. Shortening back would only lead to a greater confusion the following year as each shortened branch usually produces two or more the following year. With climbing varieties of teas and hybrid teas the current

year's lateral growths should be pruned back to within 4 or 5 eyes of their starting point and all vigorous growth starting up from the base should be made room for, if necessary by the entire removal of one or more of the oldest leaders. All dead branches should be removed and each leader should be provided with sufficient room for the full development of its laterals.

Pruning done, one inch of the surface soil of the bed, including dead leaves, etc., should be taken away and a top dressing of about 2 inches of the best manure available should be given and a light cultivation should follow, not going deeper into the soil than 3 to 4 inches. This can be followed by a thorough soaking of water. It is usually advisable to follow the first watering by a second with 3 or 4 days' interval to ensure penetration to the full depth. After this, watering should not be necessary for 10 to 15 days but in the meanwhile, whilst the soil is still moist without being wet, a cultivation with the *khurpi* can be done and before giving the third watering a dressing of nitrate of soda or Niciphos at the rate of $\frac{1}{2}$ lb. per 100 sq. ft. (maximum 1 oz. per sq. yd.) can be sprinkled on the ground immediately before watering. Two similar dressings of nitrate of soda or Niciphos can be given at 15 days' interval, immediately followed by water; but great care should be taken not to give too much of any artificial manure at one time, as although roses could be given heavier dressings without danger, it is seldom that a plant recovers from an overdose, and when in doubt two small dressings at 10 days' interval are better than the risk of injuring the plants by one large application. Liquid manure made from fresh cow or sheep manure can be given with advantage but it is not absolutely necessary if a good top dressing of manure is given after pruning.

A dressing of bone meal is good. It is slow in action and an overdose is not likely to produce serious effect.

The method often followed in India of removing the soil and exposing the roots of roses to the sun after

pruning is wrong and should on no account be practised; neither should deep cultivation be practised nearer than 18 inches to 2 feet from the base of the tree, as this destroys the surface roots which are required to respond to good cultivation and feeding.

After 3 or 4 years it will generally be found necessary to renovate a rose garden. It will be found on examination that the cultivation of the plants varies considerably, some having aged or deteriorated quicker than others, and the owner will be tempted to retain the better plants and only replace those which have gone beyond the stage at which they can possibly be of further use. This is a mistake and many rose gardens are ruined in this way. In the first place thorough soil preparation is necessary which cannot be done unless the beds are entirely vacant; secondly, the plants are too old to stand successful transplanting; and, thirdly, even were this possible a mixture of old and young plants can never make a successful rose garden as by the time the new plants are well established and at their best the old plants will be decaying and dying out and that uniformity of growth and bloom so necessary for the good appearance of the rose beds can never afterwards be attained. The only remedy for an aged rose garden is complete renewal both as regards soil and plants.

The old soil should be excavated from the beds to a depth of 3 feet and good rich loam substituted, preferably the top "spit" of an area covered by a good growth of *doob* grass. If this can be found within the compound limits all the better as regards labour and expense, as the one can be substituted for the other, but if not available immediately at hand a close look round will usually find such an area within a reasonable distance and if the old rose soil is utilized for filling the excavated area it loses nothing by the exchange.

The beds should be refilled and remade and planted strictly in accordance with the process described for new beds in the earlier portion of this chap-

ter. The work may be rushed through at the close of the winter season or in October. In the former case the plants will have to be very carefully handled and afforded some artificial shade for a couple of weeks or so.

In India roses generally are propagated 'by budding or cuttings. Plants grown from cuttings have some advantages over budded plants. They have a longer life and there is no foreign stock trying continuously to assert itself. On the other hand however it is found that budded plants derive much benefit from the vigour and strength of briar plants. On the whole therefore budding is worth while although more troublesome than growing cuttings. This method also succeeds better in dry climates.

Like all other branches of gardening, roses have their troubles. The pests which attack roses in India are not numerous but their depredations must be guarded against and, if possible, they must be exterminated as soon as they make their appearance. Whiteants, thrips, green fly and mildew are the worst enemies.

Whiteants may be dealt with in the manner described on page 148.

Thrips are difficult to eradicate but syringing with phenyle-kerosene emulsion will destroy most of them. This emulsion is made up as follows:—

2 parts phenyle.
1 part kerosene.
50 parts soap suds.

Another useful spraying mixture is tobacco water consisting of—

$\frac{1}{2}$ lb. country tobacco leaf.
4 gallons water.
4 oz. soap.

The tobacco should be boiled in 1 gallon of water and strained. The soap should be dissolved in this solution and the rest of the water then added. The mixture should be used when cold.

The green fly usually appears when the flower buds are forming. They may be removed with the hand, or the affected parts dusted with fine tobacco powder or the tobacco solution described above.

Mildew often causes much damage. It makes its appearance during spells of dull, damp weather; but it may also be found at other times where the plants are grown in a too shady position. The curling-up and mealy appearance of the leaves are sure indications of the presence of mildew.

To guard against mildew, rusts and leaf spots which are similar leaf diseases care should be observed that plants obtain an unlimited supply of fresh air. To cure the disease, spraying or syringing is necessary. Lime sulphur is recommended as a medium. It may be purchased and diluted according to directions.

Another cure in fairly general use as a spraying medium is Bordeaux mixture. This can also be used as a tonic and preventive and for this purpose should be applied generally once a year during spring. This fungicide is prepared as follows:—

Copper sulphate	2 lbs.
Quick Lime	1 lb.
Water	10 gallons

Dissolve the copper sulphate in half the water. Slake the lime to a fine powder and mix it with the remaining water and pour it into the copper solution. The solution may be stored in earthenware jars or wooden casks and not in metal vessels. When using, keep the mixture well stirred to obtain a uniform strength.

Caterpillars and leaf weevils may be eradicated by syringing the plants with the phenyle-kerosene emulsion suggested for thrips.

In all cases select a dull day for the spraying operation so as to avoid any chance of the sun scorching the leaves.

A garden syringe will be needed for applying the spraying solutions.

A final word as regards the cutting of roses for the house.

There is often doubt when gathering rose blooms as to what length of stalk should be cut in the interest of the plant. The reply is: the shorter the better. But no injury seems to occur by taking two leaves with the flower as the third eye down the stem from the bloom is usually the strongest and most advanced for producing a second crop. Roses produce three crops of good flowers before April, if pruned about the middle of October. By cutting roses with long stalks one not only cuts down into dormant eyes which take a long time to develop for a second crop but they cause a check to the plant when in the mid-season of its growth. This should be avoided. If long stalks are necessary for any purpose, not more than one or two such blooms should be cut from each plant.

Cut roses can be displayed beautifully in floating bowls.

Roses that are delicately shaded should always be gathered in the bud stage early in the morning before or very soon after the sun gets on them.

LIST OF SELECTED ROSES

**Augustus Hartmann* (HT).—Brilliant geranium red, flushed with orange. Large, well formed, very fine.

Barbara Richards (HT).—Maize yellow, reverse buff flushed warm rose. Very large, full, of exquisite form. Vigorous, free branching, bushy growth, very free and perpetual flowering. A magnificent rose, ideal for the exhibitor, and a fine garden variety.

**Bessie Brown* (HT).—Creamy white. Blooms perfectly formed. Immense size and substance. A good exhibition variety.

**Betty Uprichard* (HT).—Inner face of petal delicate salmon pink to carmine, reverse of petal glowing carmine with coppery sheen and a suffusion

*Make excellent standard plants.

of orange. Flowers freely and continuously. Blooms verberna perfumed.

Captain F. S. Harvey Cant (HT).—Rich salmon pink, faintly veined with scarlet and suffused with yellow. Flowers large and of magnificent build with high pointed centre, of great substance. Sweetly perfumed.

Christine (HT).—Deepest and clearest golden yellow; perfectly shaped flowers with petals of great substance, deep glossy green mildew-proof foliage.

**Clovelly* (HT).—Carmine rose, long on upright neck. Vigorous.

Colonel Sharman Crawford (HT).—Rich velvety crimson shaded deeper crimson toning to scarlet red towards the centre, the colour holds till the petals fall. Full, moderately large, perfect form and quality. Vigorous erect growth, bushy habit and very free flowering.

Countess of Warwick (HT).—Lemon yellow, beautifully edged with pink. Flowers erect. A splendid rose of exhibition form.

Dame Edith Helen (HT).—Pure glowing pink; full and perfect bloom. Fine erect growth.

Earl Haig (HT).—Deep reddish crimson, a solid colour that does not fade. Large size and substance, perfectly formed with high centre, petals large, smooth and massive. Splendid habit.

Ethel Somerset (HT).—Shrimp pink, edge of petals deep flesh coral pink, a lovely shade of colour. Very large, full, perfectly finished, with high-pointed centre and very deep shell-shaped petals of great substance. Splendid habit and blooms profusely.

Feu Joseph Looymans (HT).—Yellow, with vivid apricot, giving a brilliant effect in the centre. Buds long and pointed, developing into well formed blooms. Suitable for exhibition and garden purposes.

*Make excellent standard plants.

Florence L. Izzard (HT).—Deep pure buttercup yellow. Blooms long and pointed, of fine substance, perfect form, foliage mildew-proof.

Fred J. Harrison (HT).—A most noteworthy and valuable addition to the crimson hybrid Teas; in form, size and substance resembling the H.P. "A. K. Williams." Of vigorous growth and free branching habit, the blooms which are freely produced are a cardinal red, suffused with crimson and splashed with blackish crimson towards the edge of the petals, which are large, of great substance and beautifully smooth. Very sweetly scented.

**General Macarthur* (HT).—Bright crimson. large, full, free flowering. Very fine.

**Gwynne Carr* (HT).—The buds are long and pointed, opening into a full, perfectly formed bloom of the highest excellence; the petals are large, smooth and of great substance, opening well in all weathers. Colour shell pink to pale lilac rose, increasing in centre to a deeper rose, veined silver with a very distinct zone of golden yellow at base of the petals. Delightful fragrance.

Hadley (HT).—Bright red, very free and constant.

Ion Phillips (HT).—Rich yellow, large full flower. Free branches, willowy growth, producing flowers with great freedom on long erect stems.

**Lady Maureen Stewart* (HT).—Velvety black scarlet cerise, shell-shaped petals whose reflex is solid pure orangy-maroon without veining. Ideal shape, brilliant non-fading colour. Erect flower stalk. Floriferous.

Lady Pirrie (HT).—Deep coppery reddish salmon, inside of petals apricot yellow, flushed fawn and copper. An ideal variety for massing.

Laurent Carle (HT).—Brilliant carmine, large. Valuable for exhibition or decorative purposes.

Lord Lonsdale (HT).—Brilliant unfading

*Make excellent standard plants.

daffodil yellow; large, fully double high pointed blooms. Bushy erect growth. A startling yellow rose of an intensity not hitherto produced. Requires good cultivation.

**Los Angeles* (HT).—Flame pink toned with coral; long pointed buds opening to large full flowers.

Mademoiselle Irene Hennessey (HT).—Growth vigorous, flower very large, full and perfect form, very sweet-scented, colour brilliant orange vermillion.

**Madame Jules Bouche* (HT).—White, centre shaded pink. Large, full and perfectly formed. Free flowering.

Madame Segond Weber (HB).—Rosy salmon. Large perfect form.

Margaret Dickson Hamill (HT).—Delicate solid maize straw. Petals are edge flushed with most delicate carmine on back. Blooms are produced in great profusion.

Margaret McGredy (HT).—Orange scarlet, exhibition size flowers; upright growth; foliage mildew-proof.

McGredy's Scarlet (HT).—Bright velvety scarlet. Long pointed buds moderately large well-formed flowers—vigorous erect free growth, carrying its flowers erect on long stems. A good variety.

Molly Bligh (HT).—Deep maddery pink, heavily zoned orange madder at the base of the petals. Bloom are large, ideal shape, deep, spirally pointed. Very floriferous.

**Mrs. Beatty*. (HT).—Delightful perfume; perfect shape and of the exquisite self yellow of 'Marechal Niel.' Growth good; perpetual blooming. Foliage exceptionally beautiful and free from mildew.

Mrs. Curnock Sawday (HT).—Rich satiny pink, edges of petals salmon pink, long pointed buds carried erect; opening to large finely shaped flowers.

*Make excellent standard plants.

**Mrs. Foley-Hobbs* (T).—Delicate ivory white, faintly tinged clear pink on edge of petals. Blooms large. Exquisite form. Perfectly finished. Petals thick and shell shaped. Floriferous.

**Mrs. George Sharwyer* (HT).—Brilliant clear rose. Large. Well formed. Full.

Mrs. Henry Bowles (HT).—Warm rosy pink, shaded with salmon orange. Blooms great substance and beautifully pointed. Quite distinct.

**Mrs. Herbert Stevens* (T).—White with a distinct fawn shading towards centre. Blooms long and pointed. Good form. Very floriferous. Fine.

Mrs. Sam McGredy (HT).—Scarlet coppery orange flushed Lincoln red. Long buds, flowers good shape and very pretty.

Phyllis Gold. (HT).—Glowing rich butter yellow with no tendency to bleach. The petals are of great substance, broad and deep, building up a massive flower with a high pointed centre. The growth is vigorous, upright and branching.

Picture (HT).—Clear velvety rose pink. The buds are of medium size and perfectly formed; the petals pleasingly reflexed. Growth is sturdy and free. An ideal rose for garden or bedding purposes and splendid for cutting. Highly recommended.

President Herbert Hoover (HT).—Blended cerise, orange and gold. Long pointed buds. Large full flower. Strong erect growth, very free and continuous. A fascinating colour combination. Sweetly scented.

Rouge Mallerin (HT).—Pointed buds of brilliant red opening to a full flower of good high pointed centre. Splendid growth, making a really good tree, vigorous and upright with healthy green foliage. The flowers are freely produced throughout the season. A brilliant rose both in colour and general merit.

Sir Henry Segrave (HT).—Primrose yellow with chrome base. Very large beautifully-shaped flowers,

*Make excellent standard plants.

with high pointed centre, built with immense petals. Exceptionally good, hardy, free growth and perpetual flowering. A magnificent and captivating rose of superb quality suitable for either garden or exhibition. Highly recommended.

Talisman (HT).—A blending of scarlet and gold—a striking colour. Buds long pointed; medium flower. Vigorous, erect growth and free flowering. Variable in colour, otherwise first-rate. Highly recommended.

**Una Wallace* (HT).—Soft well toned cherry rose without shading. In depth, formation and substance it is faultless. Floriferous.

W. E. Wallace (HT).—Deep golden yellow without shading. A magnificent garden rose and splendid specimen flower.

William Kordes (HT).—Carmine yellow, splashed and veined carmine.

(3) CANNAS.

Cannas are of easy culture and are very effective in a large garden where they may be kept separate and distinct from other floral effects. Their highly coloured upstanding blooms show to the best advantage when planted to stand out against a background of foliage; the wind shelter thus afforded is also of benefit to the plants in the event of an exceptionally cold winter with frequent night frosts.

Unfortunately, cannas cannot be used extensively and with good effect in small gardens, as they require plenty of space and are not a success in shrubberies or in conjunction with other forms of floral planting.

Even in large gardens, where there is ample room for their cultivation, cannas are an uncertain quantity when a throughout-the-season show of bloom is required, as they are highly sensitive to frost and if cut back from this cause at mid-winter, present a

*Make excellent standard plants.

rather untidy effect till they resume growth and bloom during the latter half of March.

Planted in mid July, cannas will be at their best by the beginning of October and even in the event of an adverse season can be depended on to produce a gorgeous show of colour well up to the beginning of December.

They are gross feeders and require a rich soil and liberal supplies of water. The beds should be trenched to a regular depth of 3 feet and a liberal quantity (6" to 8") of stable manure incorporated with the soil to the full depth of the trenching. A heavy watering should then be given to bring about soil consolidation and the rhizomes planted 18 inches apart each way to a depth of 4 inches. Watering should be carefully regulated till the plants are well in active growth. If watered in excess in the beginning the rhizomes are liable to decay before they can assume activity.

Like all perennial soft-wooded plants, cannas are better for a brief annual rest and should be taken out of the beds in June and laid in shallow trenches where they may be kept on the dry side or in an open shed with the rhizomes covered with six inches or so of dry sandy soil. Care should be taken to see that the colours are kept separate and correctly labelled, otherwise there will be confusion when the time comes for replanting.

Few amateurs go to the trouble of resting cannas, as described above, and simply turn them out and replant straight away according to the period they require for their flush of bloom. This is poor culture, but the canna is so hardy and vigorous a grower that it does not appear to suffer much from lack of rest in the same way as most other bulbous or tuberous rooted plants would, if afforded such harsh treatment.

In any case, before replanting, the beds should be retrenched through to a regular depth of 3 feet and a liberal quantity of old stable manure incorporated with the soil. A heavy watering should then be given

to bring about soil consolidation and the rhizomes replanted, the stoutest and strongest roots being chosen for the purpose.

By late December, cannas will have passed their first flush of bloom but the plants may be kept active and in constant flower by forking a good dressing of rich manure lightly into their roots and watering freely. All old flower heads should be cut off just above the secondary flower spike before seed can develop. This operation is often neglected, with the result that the secondary bloom is ill-formed and poor in quality, in addition to which the appearance of the plant is spoiled by the presence of dry flowers and ugly seed capsules.

The area of the beds should be regularly cultivated or turned between waterings.

If attacked by frost there is no alternative but to cut back the plants to within a few inches of the ground.

Cannas are best grown in large deep beds for massed effect, the colours being kept separate or mixed, according to individual colour, height and strength of growth.

It is somewhat monotonous to have large beds of single varieties, unless the space devoted to Cannas is large enough to introduce a formal planting scheme. In small gardens the most pleasing effect is obtained by having mixed borders or beds in which a few choice varieties selected for height and colour are planted in fairly large clumps. Grown in this way, the various beautiful colours show to contrasting advantage. The varieties should be selected at seasons when they are at their best (*i.e.*, in October—December or April—June), so that no mistake is made about colours and heights.

If it is desired to grow cannas in large gardens for formal effect it is wise to enclose the beds with dwarf formal hedges. This not only protects the plants from damage from strong winds but hides their

untidy stems. For hedges for this purpose, *Duranta* and *Acacia modesta* are equally suitable. Hints on their cultivation will be found in the chapter on Hedges.

If funds do not permit of a sufficiently large number of plants being purchased at one time, sufficient may be obtained for one bed or border and the required plants can be propagated from this selection by the next season.

(4) ANNUALS

It will be as well to repeat here some of the advice given in Chapter I regarding the treatment of annual flowering plants.

It has been urged that it is bad taste to overcrowd a garden with too many flowers and that, except perhaps for a central feature, it is unsatisfactory to work on formal lines. In determining the location of beds of flowers it has to be remembered that plant life generally will not thrive in the shade and that no plants will do well if planted too near the north of any shade-casting object, be it a wall, shrubbery or hedge. Finally, in selecting sites for flower borders or beds one should be guided by views that can be obtained from the house, which should form the pivot of the garden.

With so many beautiful varieties of annuals at one's disposal, gardeners are often at a loss how a really representative collection may be fitted into a moderate sized garden without overcrowding or colour-clashing.

With formally arranged beds, each of which only accommodates one species, anything approaching a general collection is impossible; but a large mixed border, often called a herbaceous border, is a possibility in most gardens, and in this practically all varieties may be introduced without risk of clashing of colours or unduly exaggerating the garden colour-scheme.

This method of treating annuals is, without doubt,

the most fascinating and interesting, as within a comparatively small area many beautiful varieties may be cultivated which besides being interesting as a collection may with judicious selection and grouping form an attractive feature of the lay-out.

First, there is the choice of a general mixed border into which all colours may be introduced with assured effect, provided whites and the paler colours are not too largely used. If this point is ignored, the colour effect is liable to be weak and washy and, on the whole, disappointing.

Secondly, there is the choice of definite colour schemes such as reds and blues, blues and yellows, red, white and yellow, or others which strike the individual fancy.

One or two definite colour schemes may be used one year and others in the next season.

Experiments in colour schemes may be usefully carried out with cut flowers in vases or with plants in pots. In this way the scheme for the next season may be prepared a year in advance while the flowers are still in bloom. This helps later with the seed order.

Owners of large gardens can afford to indulge both in mixed borders and in colour schemes but in smaller gardens where space is limited efforts may be confined to the former as being the more interesting, affording as they do scope for many more varieties than when colour schemes are followed.

For accommodating plants ranging from tall to dwarf varieties a good width for the border is from 10 to 12 feet. In this width tall, medium and dwarf varieties may be accommodated in sufficiently large groups to give distinct splashes of colour. For a border of a width of 6 ft., only medium and dwarf kinds should be attempted if the maximum colour effect is to be obtained.

If required to face one way, the most satisfactory position is on the north boundary, as a southern aspect is best if the bloom and colour is to be seen at its best.

Should a two-sided effect be required, the border should, if possible, run north-south, so that both faces receive an equal measure of direct sunlight.

Faced in the wrong direction, mixed-border culture is greatly handicapped as the tall-growing kinds shade the dwarf varieties from the early morning sun, with the result that the flowering period of many is retarded and the colour effect is patchy and irregular and at no time seen at its best.

The plants selected should, where space permits, be graded into three groups, tall, medium and dwarf. Before planting operations are commenced, a rough sketch plan should be made showing the rotation of kinds and colours it is proposed to adopt in order to simplify planting, to assure a fair degree of regularity of outline and to avoid risk of the massing of different shades of the one colour.

The size of the groups will depend largely on the dimensions of the border, but the minimum length for individual groups should be 6 feet or the colours will not stand out separate and distinct as they must if a bold, striking effect is to be obtained.

For colour-mixing, seed catalogues are a suitable guide, but the heights given are often misleading for gardens in India where climatic conditions differ greatly from those of England or the Continent. Gardeners not well acquainted with flowering heights of the different varieties should seek the help of those who are familiar with the varieties chosen, for mistakes in the direction of heights will completely spoil the final effect.

The annuals available for use in gardens may roughly be classified into three groups:—

- (1) Winter flowering,
- (2) Summer flowering,
- (3) Monsoon flowering.

The winter flowering annuals contain the greatest variety and as a winter effect in a garden is the one most sought after, the use of the summer and monsoon

flowering varieties should be subordinated to the winter garden.

The beds should be prepared afresh each year to receive the winter flowering annuals.

Borders along the inner lines of shrubberies should be laid out initially in the same way as recommended for shrubberies. Having determined generally on the width and location of the border, take a good length of fairly thick rope and lay it easily on the ground along the inner alignment of the border. The rope can then be moved gradually in position until the outline pleases the eye and the curves satisfy. The outer alignment of the border should follow the inner alignment of the shrubbery but a width of at least $1\frac{1}{2}$ feet should be kept between the shrubbery and flower border to allow of treatment of the shrubbery and border.

Other borders and beds should be laid out to regular geometrical designs (square, rectangular and circular); odd and peculiar shapes definitely should be avoided.

If it is desired to make a bed alongside a road, an appreciable margin of lawn should be left between the bed and the road. This will be found to considerably enhance the effect of the flowers.

After the alignment has been fixed to the best advantage, about 6 inches of surface soil should be removed and the exposed surface trenched to a regular depth of $2\frac{1}{2}$ feet. If the soil is good the surplus earth can be spread over any unprepared part of the garden, *e.g.*, vegetable gardens or lawns, where it will prove beneficial.

The ground should be trenched and the bed treated with manure and finally completed in accordance with the process suggested for shrubberies (page 39). The work should be completed by the middle of September.

When re-preparing the beds for summer and monsoon flowering annuals such elaborate treatment

will not be necessary.

As soon as sufficient seed has been collected from the winter flowering annuals, the beds and borders should be cleared and dug to a depth of 18 inches, and left fallow for a few days before bedding out summer flowering annuals. Manure should be added very sparingly to the soil, the bulk being kept for surface mulching and applied as soon as the new plants are well established.

A similar procedure should be followed when planting monsoon flowering annuals in succession to the summer flowering annuals.

Apart from preparation of the ground, the item of most importance is selection of suitable varieties of annuals for borders and beds.

In the earlier portion of this chapter it has been said that flowering annuals can be broadly classified into three groups—winter flowering, summer flowering and monsoon flowering. These may be further subdivided into plants suitable for formal work and plants suitable for mixed beds or borders. A very limited number of varieties are suitable for formal effect and for this purpose it is always advisable to obtain imported seeds as acclimatised seeds are not always sufficiently true to type for formal work.

Annual most suitable for formal work are the following:—

Winter Flowering:

Pansies and *Violas*.—These can be used very effectively in self colours or in blue and yellow or mauve and apricot schemes.

Phlox (dwarf types).—These can be used in self colours or in pink, red and blue schemes.

Dianthus (annual pinks).—These can be used in self colours or in white, red and pink schemes.

Verbenas (bedding varieties).—These can be used in blue, red and pink schemes, or self colours.

Arctotis (hybrids). *Antirrhiniums* (dwarf varieties),

Petunias (bedding varieties) and *Stocks* (dwarf varieties) may also be used in formal schemes, but these are not nearly so effective as the kinds previously named.

Summer Flowering:

Portulacas.—These beautiful flowers can be had in various bright colours.

Calliopsis (dwarf).—These can be had in bright colours of yellow, orange and red.

Monsoon Flowering:

Zinnias (dwarf and pompom).

Alternanthera can be used effectively for edging formal flower beds. Although not extensively used upcountry on account of its liability to frostbite, it forms an effective edging for dwarf annuals in a sheltered situation and may be used to advantage in protected parts of the garden. It is seldom seen at its best because of the common habit of leaving it in its permanent position throughout the year, which lack of attention causes an irregular, woody habit of growth, completely spoiling it for the only purpose it can serve. The plants should be taken up during the hot weather and laid in nursery beds till about the middle of August when the plants may be subdivided and replanted in the required position.

While the kinds of annuals suitable for formal effect are few, there is an almost unlimited selection of varieties suitable for mixed beds and borders for all seasons.

Most gardeners distribute their orders for pet strains of flowering annuals over several firms in the belief that certain firms have specialised in producing superior strains of particular kinds. There is much to be said for this system, particularly when growing the more choice varieties for exhibition purposes. For flower borders, however, except in a few instances, one should in the main rely on acclimatised seeds.

The process of collecting seeds and the advantages to be derived from using acclimatised seeds are de-

scribed fully in the chapter on seed collection. Even in cases in which an owner does not collect his own seeds, it is advisable to depend generally on acclimatised seeds which can be purchased cheaply from Government gardens and private seed stores.

The varieties suitable for mixed borders or beds are listed below:—

Winter Flowering Annuals

<i>Acrolinum.</i>	<i>Linum grandiflorum</i>
<i>Ageratum</i> (Floss flower).	(Scarlet Flax).
<i>Anchusa capensis</i> (Cape forget-me-not).	* <i>Larkspur</i> (annual delphinium—in many colours).
* <i>Arctotis grandis.</i>	<i>Lupins</i> (annual flowering).
* <i>Arctotis hybrids.</i>	* <i>Nemesia</i> (in many colours).
* <i>Antirrhinum</i> (Snapdragon, many varieties and colours).	<i>Nicotiana</i> (flowering tobacco).
* <i>Brachycome</i> (Swan river daisy).	<i>Nycterinia.</i>
<i>Calendula</i> (English marigold).	* <i>Nasturtium</i> —(dwarf double and single flowering varieties).
* <i>Calliopsis.</i>	* <i>Petunia</i> (bedding varieties).
<i>Candytuft.</i>	<i>Pansies</i> (preferably self-colours).
<i>Cornflower.</i>	* <i>Phlox</i> (many colours).
<i>Chrysanthemum</i> (annual single-flowering).	<i>Salvia splendens</i> (sage).
* <i>Clarkia elegans</i> (many shades).	<i>Salvia farinacea.</i>
<i>Clarkia pulchella.</i>	* <i>Stock</i> (many varieties and colours).
<i>Cynoglossum.</i>	<i>Statice</i> (sea lavender).
<i>Dimorphotheca</i> (Star of the Veldt.)	* <i>Ursinia anethoides.</i>
<i>Dimorphotheca Eklonis</i>	<i>Sunflower</i> (miniature).
* <i>Dianthus</i> (self colours only).	<i>Venidium fatuosun.</i>
<i>Eschscholtzia</i> (California Poppy).	<i>Venidium calendulaceum.</i>
<i>Hollyhock.</i>	<i>Verbena</i> (many colours).
<i>Leptosyne.</i>	<i>Violas</i> (preferably self-colours.)
<i>Linaria</i> (Toad Flax).	

*These are good varieties for decorative pot work, see Chapter VIII (7).

Apart from *Salvia splendens*, which achieve their best in partial shade, all cold-weather annuals are sun lovers and succeed really well only in the open, away from the shade of trees or buildings. For a regular well-balanced mid-winter effect, all should receive an equal measure of sunlight, particularly at early morning, as it is the early morning sun that is most important, warming as it does the plants and soil and causing early activity on the day's growth.

Two hours' early morning shade will delay the commencement of the flowering period from three weeks to a month and often causes an unbalanced effect in what is otherwise a well-designed floral garden.

However, an attractive garden must contain shade trees; and, if through necessity flower-beds do fall within partial shade, the obvious course is to select kinds that are least affected by it. These unfortunately are very limited in number; in addition to *Salvia splendens*, *Cineraria*, *Nicotiana* (red and white), *Petunia*, *Nemesia*, *Phacelia*, *Calendula* and *Larkspur* do fairly well in, partial shade.

When required in quantity for mixed borders or for massing in the open, *Nicotiana* is best sown direct at site, thinly, on a flat-topped 6-inch high ridge where the seedlings will be safe from rain, even if downfalls are prolonged and heavy.

Failing the necessary quantities of seed for this, sow thinly into nursery beds, pot into 3-inch pots as soon as large enough and transplant to the open when about 4 inches high. Transplanting direct from seed beds to the beds while the weather is still hot is the cause of many failures with this species and results in ragged groups of plants in different stages of growth.

With proper handling, *Nicotiana* of the red and white varieties may be had in full bloom by the third week of October and will continue in flower well into March. Sown late, it is retarded by the cold and sel-

dom produces a good show of bloom before the middle of February.

Other kinds, which are best sown direct where they are to flower, are *Linum*, *Linaria* and *Larkspur*. For rapid germination, the latter will need to be kept shaded and, with all three, results are more certain if the seed patches are raised about 4 inches above surrounding levels to facilitate rapid drainage from the roots after heavy showers of rain.

Salvia splendens should in all cases be raised in sheltered seed-beds, grown on in pots in partial shade and transplanted to the open only when cooler weather obtains. Exposed early in the season when the sun is strong, the light is too intense for them resulting in the destruction of chlorophyll and consequent sickly plants which never recover after having once lapsed into this state.

The blue variety, *Salvia farinacea*, is a much hardier type and may be fully exposed from the commencement. It must be sown in the summer and fully developed before the cold sets in, otherwise it checks and makes no show in the garden till warmer weather sets in and activity of growth recommences.

If the border is small and it is desired to include hollyhock which normally grows to a height of over 6 feet, the plants can be stunted by growing them in 8-inch pots which can be sunk in the ground. Alternately, a layer of brick or stone ballast may be placed at a depth of 8 inches or so in the beds where the hollyhocks are to be grown. This treatment will restrict the growth of the plants but not the flowers.

The first sowings of the hardier kinds of annuals for the winter borders should be in the seed-beds by the first week of August, and as seed lists often give wrong ideas of the stocks carried it may be necessary to correspond with several sources of supply before the list of kinds required is complete. Those who place a meagre order and rely on the *mali* to procure the rest are courting failure and disappointment. He

will either produce seed of his own collecting or procure it from other *malis* whose ideas of selection and colour conservation are as vague and confused as his own. The result will be a jumble of varieties and a hopeless mixture of colours which will not be apparent till too late in the season for the owner to make other arrangements, unless he is prepared to sacrifice the early cold-weather show of bloom and wait till the middle of February before his borders produce anything in the way of colour effect.

Directions regarding the sowing of seeds and cultivation of seedlings are given in chapter IX (4). It will pay a hundred-fold to observe these directions carefully.

When transplanting seedlings and beds study the weather and soil conditions. Transplant into a thoroughly moist soil during late evening, if the weather is sunny and bright, and immediately sprinkle well with the water-can to wash the soil well in round the roots. Should an abnormally hot spell prevail at the time, a small expenditure on straw *sirkis* will prove a good investment, as their shade will save many seedlings, and help to ensure regularity of growth and bloom, which is seldom acquired when several replacements are necessary. If these are promptly made good, there is but little difference in growth. If there is a considerable interval between deaths and renewals, the symmetry and regularity in flowering of the groups is badly affected in consequence.

After transplanting a few deaths will invariably occur, and it is in making these good that the danger of confusion arises. Only a few of each kind are required to fill vacancies, and these are invariably brought along by the *mali* in one basket and no precautions adopted to prevent intermixing of seedlings. To reduce such risks to a minimum it is advisable to provide a few extra seedlings in each batch, when carrying out the initial transplanting, and use these for replacements in their particular groups. In this

way, there can be no mixing of colours, provided the *mali* is prevented from transplanting seedlings from one group to another. The additional seedlings used for this purpose should be planted between the permanent plants, which should be correctly spaced. Then, if all are not required for replacements, the balance may be discarded without upsetting the regularity of the group from which they are removed.

Summer Flowering Annuals

Salvia farinacea.

Petunia-(acclimatised).

Gaillardia grandiflora.

Sunflower (miniature).

Vinca (pink and white—periwinkle).

Calliopsis (many varieties and colours).

Cosmea (pink and white).

Portulaca.

Tithonia speciosa.

Marigolds.

With the exception of *Petunia* and *Portulaca*, the annuals listed above will continue to flower throughout the rains until the time comes for preparing the borders for winter sowing.

Preparations for sowing seeds of hot weather annuals for bedding purposes should be made by the middle of February. The seed beds should be constructed in an open airy situation so as to ensure sturdy growth from the commencement as the weather will be decidedly hot by the time they are transplanted to open beds, and weak sappy seedlings will have but a poor chance of surviving the change if the seed beds are at all sheltered and the plants elongated and weak in consequence.

Scatter the seed thinly so as to avoid the primary handicap of too dense germination and encourage hard fibrous growth by keeping the soil on the dry side till the plants are about one inch high and ready for transplanting into pots or nursery beds. If left too long they will rapidly overcrowd and elongate and

the casualties when transplanting will be numerous.

Even with seedlings of the right type transplanting is difficult at the middle of April when hot, dry winds are blowing, and it is advisable to grow the seedlings in 4-inch pots to avoid excessive root disturbance when finally transplanted. If this is too expensive the next best method is to transplant into nursery beds and afford shelter for the first four or five days succeeding the transfer, after which gradually harden off by exposure to sun and wind.

Monsoon Flowering Annuals

In addition to the summer flowering annuals, the following are useful:—

Amaranthus tricolor (Jacob's coat).

Balsam.

Celosia plumosa (Feathered cockscomb).

Cosmea (yellow).

Marigolds.

Gaillardia grandiflora (Blanket flower).

Torenia fournierui.

Zinnia (many varieties and colours).

Gomphrena globosa (Globe amaranth).

Sow the seed in good time so as to have well grown seedlings ready for transplanting with the first showers of rain. Late sowings mean late flowering, and the plants will be at their best when the time comes for the preparation of beds for cold-weather annuals. Sow sparsely and give the seedlings plenty of room for development in order to encourage a sturdy habit from the commencement. Should the rains prove later than usual, the seedlings, with the exception of *celosia*, may be topped and transplanted into nursery beds from which they may be safely transplanted as soon as favourable weather arrives.

These sowings should not be confused with the late autumn batch raised for early winter cut-flowers. These will be sown in early August, and will require special accommodation in the vegetable garden or nursery where they will not interfere with arrange-

ments for cold-weather planting.

Generally speaking, the monsoon flower border is the least troublesome of the three seasonal plantings. Once the plants are established, the rains provide the necessary irrigation, the only drawback being that, with a too rich soil, the plants are liable to run too much to stem and foliage. For this reason manure should be but sparsely used when preparing the beds; in fact, if manure has been freely used at other times, it is advisable to withhold it altogether.

(5) SWEET PEAS

Here are sweet peas, on tip-toe for a flight :
With wings of gentle flush o'er delicate white,
And taper fingers catching at all things,
To bind them all about with tiny rings.

KEATS.

The charm of sweet peas seems never to diminish and they are still the favourites of most garden lovers.

The introduction of the early flowering strain has enabled gardeners in plain stations to grow sweet peas, equal in all respects to the original winter flowering varieties.

Although the cultivation of sweet peas is so desirable, their introduction into a small garden is a problem because of their untidiness during the growing period. Unless the supports are neatly erected, a border of sweet peas in a prominent place will mar the harmony of a small garden for the considerable period that elapses before the plants come into bloom.

Care must be taken therefore, to site sweet pea beds so that they will not unduly intrude on the garden during the growing or immature stage.

Sweet peas must be free from all shade and do best in beds running north to south. In this way they get the full benefit of the sun. It will be found, however, that the flowering effect is much more effective facing east than facing west. The reason for this

is to be found in the benefit derived from the early morning sun.

If for any reason the beds cannot be fitted in north-south and must be made east-west, it should be remembered that the flowering effect will only be obtained facing south. The flowers that appear on the north facing will be few and far between. If it is desired to grow sweet peas in parallel trenches, there should be a distance of six feet between the lines. If sweet pea borders can be protected from the force of strong winds it will be a decided advantage.

Sweet peas will grow in any good garden soil, although they prefer a sandy, open soil; the one essential being good drainage.

Success with sweet peas depends largely on thorough and adequate ground preparation. Shallow trenching can only result in weak growth. Deep trenching is necessary to maintain a root range of two feet. A width of two feet should be allowed for each row of sweet peas.

The alignment should be nicked (*dagbelled*) or otherwise marked and the ground cleared of all weeds. The top soil to a depth of 9 inches should then be excavated and placed evenly along one side of the trench. On completion of this operation, the exposed soil should be excavated to a depth of 21 inches and laid evenly along the other side of the trench.

It is desirable to keep the two soils separate as the top spit which has been exposed to the sun and air has more nutritive value than the bottom spit.

If the subsoil is clayey and there is a risk of water-logging, it is a good plan to spread a four-inch layer of brickbats or clinkers at the bottom of the trench before returning the excavated soil.

The trench should now be refilled as follows:—

9 inches of earth taken from the bottom spit spread evenly throughout the length of the trench.

6 inches of cowdung manure or compost spread evenly throughout the length of the trench.

The first layer of manure and soil should then be well mixed and levelled.

6 inches of soil taken from the top spit spread evenly throughout the length of the trench.

3 inches of cowdung manure or compost spread evenly throughout the length of the trench.

The second layer of manure and soil should then be well mixed and levelled.

The balance of soil of the top spit spread evenly to a depth of about 3 inches throughout the length of the trench.

$\frac{2}{3}$ rd inch of well matured leaf mould or compost spread evenly throughout the length of the trench.

The third layer of filling, consisting of leaf mould or compost and soil should then be well mixed and levelled.

The prepared trench should be flooded to ensure settlement and finally levelled.

The preparation of the bed in the manner described above *should be completed at least two months before sowing time*, and the surface of the bed should be frequently cultivated throughout the waiting period.

In the plains, seed is best sown in October and, where necessary, the bed should be thoroughly re-watered a few days before sowing. The seed can be sown in one or two rows as desired. For general utility and garden effect, two rows are preferable, but if required for exhibition purposes, only one row should be grown. The seed should be sown in raised drills at intervals of at least 6 inches between the seeds.

After sowing, the bed should be lightly covered with dry grass and then watered. The presence of the grass will not only conserve the moisture in the

soil but will serve as a protection against damage by rats, squirrels or birds. The seed should germinate in a week or ten days, hard-skinned varieties taking longer.

As soon as the young plants produce their second pair of leaves the grass should be removed and short twiggy branches, about a foot in length, inserted between the plants to act as initial supports and protection from birds, etc. When the plants are about 4 inches high, the tops should be pinched to encourage side growths which are always stronger than the main shoots. Not more than four side shoots should be kept on each plant, the remainder being removed as soon as they appear.

The provision of suitable supports for sweet peas is a problem. They should be allowed to grow as high as they will and staking should be arranged at least to a height of 6 feet.

Usually twiggy branches of various plants are used to support the plants but this is untidy and unsatisfactory. A better method is to sink stout posts into the ground at intervals of 12 feet and fasten 4 or even 5 strands of thin but strong wire to these. Split bamboos are then drawn down alternately between the wire strands and fixed for a short length in the ground. A support prepared in this manner is required for each row of sweet peas.

When sweet peas are grown for ordinary garden and ornamental use, the split bamboos should be fixed at intervals of 6 to 9 inches in order to provide close support for the plants.

Sweet peas grown for exhibition purposes should receive special treatment. The plants should be grown at least 12 inches apart. Two split bamboo supports should be provided for each plant, spaced about 6 inches apart. Each plant should be allowed to carry only two stems. These stems should be tied from the very start to the previously provided supports. All tendrils should be removed so as to concentrate

the whole strength of the plant on the development of the flowers.

If, as is not unlikely, the plants reach the full height of the supports before being allowed to bloom, it is feasible to cut the ties, lay the stem of the plant along the ground for a length of about 2 feet and take it up by another support. In this way the supports of adjacent plants can be exchanged and the height kept within controllable limits.

The second and third lot of blooms are generally the best. It is necessary, therefore, to remove all flower buds up to 2 or 3 weeks of the date fixed for the exhibition.

If it is desired to grow a row of sweet peas for garden effect and another for exhibition blooms, the latter should be placed at the back of the former. This is necessary as the exhibition plants will only produce flowers at the top of the plants.

Sweet Peas are excellent for indoor decoration and if space permits it is advisable to cultivate some varieties of selected colours for cut work. These may be grown best in the cut flower garden. (See page 168)

Succession sowings for this purpose may be made in September and October.

Liquid manure, particularly that made from fowl droppings, is excellent treatment for sweet peas, and it may be applied at suitable intervals throughout the growing period. Small doses of ammonia sulphate are also beneficial in the early stages of growth.

Sweet pea seeds should be purchased from firms of repute and the colours should be grouped separately to secure the best effect. Colours can be graded to suit the taste of the owner.

For the show table and for vases, sweet pea blooms should be picked early in the morning and immediately placed in water to avoid wilting. Once blooms wilt they never recover their former freshness.

(6) ROCK GARDENS

A well-constructed and properly planted rock garden may well be a very attractive feature of a garden on the plains, and serves in several ways to break the monotony of the general lay-out.

In the chapter on Lay-out it has been suggested that it may not be a bad idea to design the circular area of ground surrounded by the approach road with a formal rock garden. The possibility of working a rockery into the scheme of planting in "My Lady's Garden" has also been recommended.

In addition to these treatments, a rockery may be used effectively to break flat expanses of ground so constructed as to facilitate irrigation, or as a raised margin to hide objectionable features such as waste ground, propagating plots, vegetable gardens, etc., or for ornamenting positions of dense shade where flowering annuals cannot be expected to thrive when planted in the ordinary way.

Although rockeries are commonly seen in Indian gardens, they are seldom of the correct type either in regard to construction or method of planting and, with the plants developed and in flower, resemble nothing more than a regular mound of colour, the natural effect so essential in a successful rock garden being entirely lacking.

When planning the construction of a rockery, use natural rock, if available in the locality, and endeavour to copy nature in a small way by avoiding anything approaching formal outline. Intersperse the smaller stones with boulders of substantial size, which here and there, should present a vertical face against which plants of taller habit of growth may be grown. Always bear in mind that with all the plants in full growth and bloom a moderate amount of rock surface should still be visible, if the best rockery effect is to be obtained.

In shaded rockeries, although boulders may be

introduced here and there with good effect, it is better to rely mainly on lime furnace clinkers, as they are porous and absorb and hold moisture, thus helping to maintain a state of general humidity in which foliage plants thrive best.

The outline and design of all rockeries should first be made roughly with earth and a dressing of well-rotted leaf mould or other manure mixed with the soil before the rocks or clinkers are added.

In foregrounds or in formal ornamental gardens, scope for natural effects is somewhat limited; but, with patience and a little ingenuity, much may be done to avoid the too common effect of a formal mound of colour which, although ornamental, lacks variety and interest, being practically nothing more than a raised mixed border.

In backgrounds, opportunities are much greater. Height and width being as a rule unrestricted, give opportunities for colour-massing on a more extensive scale and considerably widen the choice of subjects for planting.

In positions of dense shade where *doob* grass will not grow and where ordinary flower beds cannot thrive, the rockery is the only really effective solution in transforming an unattractive area into a pleasing adjunct to the general scheme. In this instance the scheme need not be based on natural lines.

The plants suitable for a shady rockery are, of necessity, nearly all ornamental foliage plants, but here and there a group of annuals of the type that succeed for a time with the absence of direct sunlight may be introduced. The latter are best raised in pots and transplanted on to the rockeries or the pots plunged in the soil just as they begin to bloom.

Violets are also successful and valuable in shady rockeries.

For rockeries in the foregrounds or in formal gardens, it is pleasing to work to a colour scheme. Yellow, blue and white, (alpine colours); will generally

produce the most effective result.

For small rockeries or for dwarf effect there are innumerable plants that may be tried, but the following annuals will be found most suitable:—

Violas, *Brachycome*, *Candytuft*, *Nycterinia*, *Nasturtium*, dwarf single *Petunias*, *Verbenas*, *Dimorphotheca*, dwarf *Ursinia*, *Matricaria* and dwarf *Californian poppies*.

For intermixing here and there against the vertical faces of boulders, the following tall growing varieties may be used:—

Cynoglossum, *Anchusa*, *Arctotis* hybrids and *Calliopsis coronata*.

If it is decided not to adhere to a yellow, blue and white colour scheme, the following varieties of plants may also be used:—

Amaryllis, *Freezias*, fibrous-rooted *Begonias*, *Ranunculus*, *Anemones*, *Gerbera*, *Cinerarias*, *Dianthus* and *Phlox*.

The plants should be grouped in irregular patches of varying sizes, avoiding as far as possible defined margins by allowing the varieties to slightly intermix.

For rockeries in backgrounds where more space is available, the individual groups should be larger and some tall, strong-growing annuals may also be introduced.

For shaded rockeries where effects are chiefly dependent on foliage plants, the following plants will thrive, if freely watered and if surroundings are well damped with the syringe in the early morning and late evening:—

Ferns of different varieties, Dwarf Palms, *Crinums*, *Crotons*, *Chlorophytum*, *Aspidistra*, *Asparagus plumosus*, *Asparagus sprengeri*, *Dracena*, *Cyperus alternifolius* (semi-aquatic), *violets* and *Ophiopogon intermedius*.

Here the opportunities for grouping are more restricted, being limited to the smaller kinds such as *Asparagus*, *Chlorophytum*, Ferns and *Ophiopogon*.

To introduce some colour, the following varieties of plants will last for a time in bloom if grown in pots in the open until bloom begins and then grouped among the foliage plants by plunging the pots in the earth:—

Petunias, *Salvia splendens*, *Cineraria*, *Anemones*,
Ranunculus, *Myosotis* and *Gerbera*.

Before making a final selection of foliage plants, it is necessary to consult the local gardens or otherwise discover by personal investigation what varieties thrive best in the locality. It is wise and profitable to confine one's choice to those that have succeeded after trial.

CHAPTER VIII—OTHER ESSENTIALS

(1) SOIL

It is generally possible to obtain a fairly accurate idea of the suitability of soil for gardening purposes from neighbouring results. Roughly there are two main types of soil—light and heavy, or sometimes described as sandy and clayey. The ideal rich fertile soil of the cultivated garden is something midway between these two types, with plenty of decaying vegetation, called humus, mixed with the original soil.

Clayey or heavy soil is generally very fine river mud or silt and is sticky and heavy to dig. It needs something to make it more friable allow more air to penetrate to the plant roots and to keep it from setting hard and then cracking. Where clayey soil exists, drainage may sometimes be necessary—see Chapter VIII, (2) Drainage (page 148).

The mechanical character of clay can be improved by adding strawy manures, leaves, decayed refuse and coarse sand or grit. A lime dressing over the surface, after digging, at the rate of $\frac{1}{4}$ lb. to a square yard will

further break down the particles and make the soil more friable.

Clayey soil is improved by the use of horse manure which is warm and quick to decompose.

Sandy or light soil may be improved a little by the addition of clay from some other part of the garden or district.

Cow manure which is solid, cool and slow decaying stuff is preferable for light soils.

Occasionally it is necessary to deal with water-logged or alkaline soil, both of which are unsuitable for gardening.

The ill effects of water-logging can generally be cured at small cost by drainage—see Chapter VIII, (2) Drainage.

When the soil is alkaline or otherwise unsuitable for plant life it is necessary to import suitable soil from the neighbourhood. Details for dealing with this trouble are given in the various chapters on Trees, Shrubs, Lawns, etc.

Soil on which white ants are particularly troublesome should be kept thoroughly wet by frequent irrigation as white ants dislike wet conditions.

Occasionally sprinkling the soil with a mild solution of phenyle or creosote (1 part to 20 parts water) although not an absolute preventive, will further help to keep the ants in check.

Particulars regarding the treatment of soil with manure and lime are given in Chapter VIII, (3) Manures (page 150) and Chapter IX (3) Liming the Soil (page 214).

(2) DRAINAGE

Drainage consists in withdrawing water from the soil when all the benefit needed has been derived from it. No operation is more indispensable to the well-being of a garden than this, though often it is found exceedingly difficult to effect.

The effects of drainage that are specially important are the passage of water from the surface to the lower parts of the soil, assisting the passage of air and promoting the decomposition of organic matter in the soil and consequent solution of some of the mineral portion of the soil which is necessary for plants.

Deep cultivation is often sufficient to secure this result.

It is only necessary to resort to artificial means of drainage when the land is low lying or the soil waterlogged, which is fortunately seldom the case in India, except where over-irrigation prevails.

When a garden is irrigated from a well near at hand it is probable that no difficulty will be experienced about drainage; the water finding its level in the well may be actually a most efficient form of drainage.

When canal water or the local Municipal water is used and the lower state of the soil is not open, some artificial system of drainage must be adopted.

Open drains three or four feet deep are thoroughly effective but occupy too much land and there is a danger of surface water finding its way directly into these and defeating the primary reason for draining which is not so much to dry the land as to cause water to pass through it.

Another practicable system is to open trenches one foot wide and three feet in depth, right across the badly drained ground, grade the bottom with a slope of 5 inches per 100 yards and place half circular roofing tiles or other open material such as brick ballast in the lower six inches, cover with sods or garden sweepings and fill up with earth. Such drains, although necessary on the formation of a garden, may be found quite dry a few years later, the roots of trees having taken up the work of drainage as soon as the soil was fit for trees to live on.

In lieu of circular roofing tiles or ballast, the bottom 6" of the trench may be filled with twiggy tree

branches which make admirable drainage material. The branches should be newly cut. Partially decayed wood is of no use for this purpose. If a tree branch with sap in it is buried it will not decay for years. The sticks must not be laid anyhow. They should be cut into 12-inch lengths and laid crosswise like bricks in a wall. In this way a close "lay" is obtained, while preserving a perfect percolating outlet for water. Care should be taken not to disturb the trenches when digging in future.

The procedure described above may be considered too elaborate or costly if the land is not one's own or if the tenancy is limited. In such cases water can often be got away by digging holes 3 feet deep and 3 feet in diameter at intervals of 8 feet apart and after filling the bottom 1 foot with broken bricks or stone rubble, returning the top 2 feet of soil. In this way water will be got away from the top 2 feet of soil and there should be no further trouble.

Water-logging is sometimes caused through over-irrigation and failure to cultivate or till the soil. The chapters on Irrigation and Cultivation may therefore be studied carefully as difficulties with drainage may be of the gardener's own making.

(3) MANURE AND FERTILIZERS

Manure may be defined as matter capable of increasing the fertility of soil. Manures are divided into two classes—organic and inorganic.

An organic manure consists of some kind of decaying animal or vegetable matter which contains humus.

Inorganic manures contain no humus and are generally comprised of artificial manures.

No garden can afford to do without both organic and artificial manures. A garden can exist with applications of suitable organic manure but its condition is much improved with additional treatment of artificial manures. No garden can exist with only artificial manures—the absence of humus is their weak point.

The chief constituents of plant food are the elements nitrogen, phosphorus and potash. These elements exist in various combinations in plant and animal residues.

Nitrogen occurs in animal refuse, *e.g.*, cattle dung and urine, and also in leguminous plants such as peas and beans and the leaves of trees.

Phosphorus is present in animal refuse.

Potash occurs in the stems and twigs of plants and consequently in wood ashes.

All these elements, therefore, are available in the waste materials of an ordinary garden and cowshed. In addition these materials when fermented or "rotted" furnish a brown residue known as humus which is essential to the healthy growth of plants and the proper tilth of the soil.

The following notes deal separately with the various classes of manures needed in a garden.

Organic manure.—The quantity of organic manure which may be used with profit varies greatly with soil and climate. It will be found that for all general garden purposes 12 c. ft. per 100 sq. ft. is a fair annual allowance for well irrigated lands or abundant rainfall. In hot climates without irrigation, half this quantity is a safe application. Areas under lawns, of course, need much less than this quantity. Particulars on this subject will be found in Chapter VI—Lawns.

The quantity of manure required for the construction and establishment of a garden has been given in some detail in the chapters dealing with different sections of gardening.

It may be of interest, however, to state here how the quantity of organic manure required for the upkeep and maintenance of a garden can be calculated.

The following quantities generally will be found to be sufficient:—

- | | |
|--------------------------------------|---|
| (1) <i>Annual</i> treatment of Roses | .. Top dressing of 2 to 3 inches of organic manure. |
|--------------------------------------|---|

- | | | |
|--|----|--|
| (2) <i>Annual</i> replanting of Cannas | .. | Replacement of 6 inches of old soil by 6 inches of organic manure. |
| (3) <i>Annual</i> treatment of shrubberies | .. | Top dressing of $1\frac{1}{2}$ inches of organic manure. |
| (4) Treatment of vegetables | .. | Addition of 4 inches of organic manure when preparing the garden and an addition of 2 inches of organic manure to the old soil on the occasion of each replanting. |
| (5) <i>Annual</i> planting of Sweet Peas (summer or winter) | .. | Replacement of 6 inches of old soil by 6 inches fresh organic manure. |
| (6) <i>Each planting</i> of annual flower borders and beds (summer and winter) | .. | Replacement of old soil by $1\frac{1}{2}$ inches of fresh organic manure or addition of $1\frac{1}{2}$ inches of organic manure as necessary. |

Note.—10 c. ft. of manure provides a dressing of about 1 inch for an area of 120 sq. ft.

In each case the manure should be applied and mixed with the soil in accordance with the directions given in the chapters on the relevant sections of gardening.

The quantity of manure required for a garden, calculated as above, will be found to be appreciable, and its supply is a problem which every gardener has to face.

Farmyard manure.—This is the oldest and most popular manure, and it is in itself a complete fertiliser, containing as it does the three most important plant-foods—nitrogen, phosphates and potash. These elements are present in varying proportions, according to the kind of feeding and age of the animals producing the manure, as well as to other conditions, the principal one being the care with which it has been treated. But, although it is a complete fertiliser, it is not well-balanced, as it is invariably richer in

both nitrogen and potash than it is in phosphates, the latter being retained by the animals for the building up or production of bone, muscle, milk, etc. Farmyard manure is comparatively poor in phosphates; and the great bulk of soils, while they frequently contain a considerable reserve of nitrogenous material, are also deficient in this ingredient. To remedy this lack of phosphates a general and periodical application over the whole area of a phosphatic fertiliser suited to the particular soil, (as will be indicated later) should be included in all systems of manuring if the soil is to be maintained in a properly balanced condition.

Besides introducing plant foods directly, farmyard manure is of great value in adding to the humus or organic matter in the soil, improving the texture of the soil and increasing its water-holding and heat-absorbing powers. Moreover, the application of farmyard manure conveys to the soil immense numbers of useful bacteria and, afterwards, in decomposition, provides a suitable medium for their increase, and for their activities in breaking up crude materials and converting potential plant foods into a form in use of them.

If there is a choice, use cow manure with light soils and horse manure with heavy soils. The former being solid, cool and slowly decaying stuff is better for light land. The latter being warm and quick to decompose is preferable for heavy land. Do not, however, push the preference to unreasonable lengths; use whichever kind is available rather than go without.

When more than one kind of manure happens to be available, such as horse and cattle manure or horse and pig manure, or all three, it is better to mix them together in a heap, as they then give better results than when used separately. If it should be necessary for the manure to lie for any length of time in a heap it ought to be tramped or beaten fairly firm as the heap is made, and afterwards covered with a few inches of soil, in order to conserve the ammonia,

an important fertilising ingredient which is converted into nitrogen in the soil.

Farmyard manure generally should be applied in the quantities previously recommended. In the case of poor soils the quantity may be considerably increased; but for rich garden ground which has been heavily manured for a long period, and also in the case of a rich loamy soil freshly broken in from an old pasture, the turf being incorporated, rather less than the above quantities would be sufficient if supplemented by suitable fertilisers, particularly phosphates.

The manure should be spread evenly over the ground and dug in as early as opportunity offers.

It generally will be necessary to purchase manure required for the establishment of a new garden but it is an unnecessary extravagance to purchase manure for maintenance purposes as it is an easy matter for every gardener to manufacture sufficient manure for his garden as described below.

Compost manure.—As a substitute for stable manure it will be found for general use in the garden that compost manure is most suitable. In the manufacture of this manure every conceivable form of domestic waste and rubbish comes in useful. All forms of vegetable matter including shrub and tree prunings, grass clippings, dry leaves, etc., all forms of kitchen refuse including wood ash; waste paper; poultry droppings; stable litter; in fact there is no limit to what can be used, and care should be taken to see that nothing is wasted! The Municipal refuse bin should be allowed to remain empty. When the need exists steal the contents of the neighbour's refuse bin. He'll think it crazy but don't let that worry you!

There are various methods of preparing compost, but the most satisfactory is that recommended by Dr. Gilbert Fowler for manufacturing activated compost. This maintains an exceptionally high fermenta-

tion temperature and eliminates all noxious constituents from the resulting compost.

The product is known as Activated Compost since the principle of activation is used in its preparation according to which a mass of actively fermenting material is first prepared to which fresh unfermented waste products can be added, the fermentation of which then takes place in much less time than when the reaction has to be started each time *de novo*. This principle is indeed made use of frequently by the ryot who finds that the rotting down takes place more rapidly if a little of the last year's product is left in the pit to start the new fermentation.

By this process, instead of rotting down the material in a pit, it is piled on the surface of the ground in convenient sized heaps. These heaps are moistened with a solution of cow dung and stable litter to start fermentation which soon produces a high temperature. The mass has to be stirred from time to time to ensure adequate aeration. The conditions in fact are closely analogous to those required for keeping an ordinary fire alight.

After a period of about 10 days, when the temperature begins to fall, a portion of the first heap is withdrawn and used for starting a second heap and sufficient material equivalent to the amount removed is added to the first heap. The process thus becomes continuous and results in a series of heaps with fresh material at one end, heaps of partially acted upon material in the middle, and at the other end heaps of material completely broken down into smooth brown humus ready for storage or to be used at once as a fertiliser.

From time to time the first series of heaps must be moistened with further doses of cow dung and stable litter solution; since if allowed to become dry, fermentation ceases: other series of heaps also must be moistened with weaker solution, but none must ever be allowed to get sodden.

The following detailed instructions describe how activated compost may most suitably be manufactured:—

(1) The materials required to manufacture the compost are vegetable matter, such as weeds, grass, leaves (green and dry) and domestic refuse and waste including wood ash and paper, together with a fair proportion of fresh cow dung, stable litter and/or poultry droppings. A small quantity of unslaked lime should also be available to add to the heap when initially prepared.

(2) The stable manure, poultry droppings and/or cow dung should be put into a small *pucca* tank or barrel and covered with water. The mixture should be broken up by the *mali* or sweeper, who preferably should get into the tank and tread it up until the contents are of the consistency of soup.

(3) The vegetable matter and domestic refuse initially may be stacked in heaps of about 125 c.ft. (10'x5'x2' 6").

(4) The material should be well mixed and moistened thoroughly with the solution of cow dung and stable litter referred to in (2) above, to start fermentation, which will soon produce a high temperature. A small addition of quick or unslaked lime will help to rot down green stuff.

(5) *The heaps should be kept moist with the solution and water and stirred from time to time when it will be found that the temperature will rise a good deal.*

(6) On the 11th day about one-third of each heap may be removed and piled about a foot in front of the first heap. Because of settlement and disintegration, the quantity will be found to be about 25 c. ft. It should be stacked to an area of 10'x5'.

This pile is the beginning of the second heap

of the series. The first heap may now be made up to its original size (10'x5'x2'6") with fresh material, which must be thoroughly mixed with the rest of the first heap. *Both the first heap and the first one-third of the second heap must be kept moist, but not wet, by further sprinkling with solution.*

(7) The temperature of the first heap will again rise and on the 21st day one-third of the heap should be removed and added to and well mixed with the first one-third of the second heap which will now be about one-third the size of the first heap. The first heap should be completed as before with fresh material.

(8) On the 31st day this operation will be repeated and the first and second heaps will then both be of full size, *i.e.*, the first heap will be 125 c. ft., and the second about 75 c. ft.

(9) On the 41st day the third heap of the series will be started; by taking one-third of the second heap, making up the second heap to its full size with one-third from the first heap, which will again be brought to its full size by a further addition of raw material.

(10) On the 51st and 61st days the operation will be repeated as above and there will then be three heaps. The initial heap will be 10'x5'x2'6" and the other two will be about 10'x5'x18".

(11) On the 71st day material in the third heap should be ready for use. There will be evidence of this by the complete disintegration into a smooth humus of all the leaves and plant fibres. If the manure is ready, one-third should be taken away from the third heap, passed through a $\frac{3}{4}$ " screen and stored ready for use.

(12) It will be seen that fresh raw material is only added to the first heap and that the quantity required is about 40 cubic feet every 10 days, for a single series of heaps.

(13) A single series of compost heaps prepared in this manner after the initial period of 71 days will produce about 20 c. ft. of compost manure at intervals of 10 days.

(14) Ten series of heaps (which can be conveniently worked with the interval of 10 days treatment) will produce 20 c. ft. a day or 7000 c. ft. a year, sufficient for a garden of one and a half acres in area.

(15) The area of ground required for a complete installation of 10 series of heaps is about 120 ft. x 25 ft.

Compost manure manufactured in the manner described above can take the place of both stable manure and leaf mould. It will be found evenly balanced and potent.

The manure can be prepared in this manner throughout the year and there should be no difficulty in manufacturing sufficient for the entire needs of the garden. If there is a shortage of vegetable or waste matter, it will be found economical to purchase what is required, rather than purchase manure.

It is advisable to keep a simple chart on which can be recorded the date of making the various heaps, watering, remaking, etc. It will further help control if one series of heaps only is made if the operations are done on the 10th, 20th and 30th days of the month.

A fairly intelligent *mali* or sweeper will soon get into the way of carrying out the simple tasks required of him to ensure success. Ten series of heaps will need almost the whole time attention of one labourer.

Leaf mould.—If difficulty is experienced in manufacturing compost manure, garden sweepings may be used to manufacture "leaf mould."

Leaf mould contains much of the mineral food of plants in a readily soluble form and as it retains moisture and beneficial bacteria it is useful in a compost for seed growing and the propagation of soft-

wooded plants but it is not a stimulating manure and is not suitable for ordinary garden work.

Leaf mould is produced by storing garden sweepings in a moist pit until the leaves break freely when sifted. The time necessary to prepare the manure depends on the degree of moisture, the temperature, and the bulk of the manure. Although it causes a loss of nitrogen, high fermentation is desirable to destroy the seeds and roots of weeds that may be in the pit and a regular system of filling the pits is desirable so that one pit may not contain decayed and lately gathered material at one time, when labour will be wasted in the removal of the decayed portion. Several pits of a size 8'x4'x3' deep in inobtrusive portions or in the "work room" of the garden may be prepared and all sweepings taken to one pit only at a time. When one pit is filled and heaped three feet above the ground, a covering of soil should be applied and irrigation water turned on frequently. When the mass has sunk to the surface level it will be found ready to dig out and after a few days' exposure on the surface will be ready for use.

The ordinary method of making leaf mould as described above takes a long time (about a year) in the course of which some of the necessary food elements may be lost, either by escaping into the air, as in the case of nitrogen, or by being washed away into the soil. Moreover, at no time does the temperature necessarily rise very high and so the larvæ of insects are not destroyed and seeds of weeds may still be present to germinate later when the manure is put into the soil.

Green manuring.—In places where there is a shortage of stable or compost manure, "green manuring" can be adopted with advantage. "Green manuring" is the digging in of a crop grown for that purpose.

In itself green manuring is not as good as farmyard manuring, but when it is supplemented by certain selected chemicals the difference in results between the two systems is not appreciable.

Good green manures for India are "Spinach" and "Lucerne," both of which are of vigorous growth.

As soon as the land to be green manured is available it should be lightly turned, all large weeds being removed in the process, and the seed of the selected crop should be sown broadcast.

The crop should be cultivated as usual and just before it is ready to seed it should be dug into the ground.

The simplest and most effective method of digging in is described below:—

At one end of the land take out a trench 18 inches wide and 12 inches deep. Next cut down an 18-inch wide strip of crop, lay it in the open trench and cover it with a 1-foot layer of "stripped soil." The work should proceed in this manner until the whole crop is "dug in."

If, before covering in the trench, freshly slaked lime, at the rate of 3 ozs. per square yard, is sprinkled on the green crop, it will be helpful, as it both sweetens and neutralizes the acids that always accompany the decay of vegetable matter.

It will still further improve matters if a dose of sulphate of ammonia at the rate of 1 oz. per square yard is forked in to the top 6 inches of remade land before it is brought into use, for which purpose it should be ready within 2 or 3 months of "digging in."

Poultry and Pigeon manure.—This is a rich and valuable manure, but one that rapidly deteriorates if it is allowed to ferment, or is washed with rain. To avoid this loss it should either be kept dry under cover and be turned occasionally, or if placed in a heap outside it should be mixed with about an equal bulk of soil. If mixed with soil it may be applied at half the rate recommended for ordinary farmyard manure, but if used in its fresh, pure state at only a quarter of that rate.

Inorganic and artificial manures.—No gardener can afford today to do without artificial manures. The ideas that artificials, being more easily applied than stable manure, are the refuge of the work-shy gardener and that, in addition, they spoil the condition or texture of the land, are but memories of the past. Both ideas are utterly erroneous.

With negligible exceptions, artificials are of mineral origin—dug from the bowels of the earth, as in the case of sulphate of potash; quarried from its rocks, like superphosphate of lime, or recovered from the waste of some manufacturing process, as in the case of basic slag and sulphate of ammonia.

When you handle these manures, there is no sign of straw, hay, litter, or the usual accompaniments of animal excreta. The absence of these things proves to you that artificials contain no humus. This is their weak point.

Humus is just as necessary to successful growth as food. It lightens heavy land, gives light land body and makes possible to all land the admission of air and the proper circulation of water, providing at the same time a congenial home to those hosts of tiny, wonderful beings called bacteria, on whose activities so much depends.

Since artificials do none of these things, but only add food, it is obvious they are not a basic factor. Use them, however, in soils already well supplied with humus and they will double the yields.

There are three main food elements required by plants; they are nitrogen, potash and phosphoric acid or phosphate.

Nitrogen.—The general effect produced by the application of some single element of plant food is fairly well marked, and is a guide in determining what material should be applied or made to predominate in manuring individual crops. Nitrogen is the substance chiefly concerned in vegetative growth—that is, in the production of leaves, shoots and stems—and it is the material to apply when a rapid or increased

growth of these is desired, or when a crop lacks vigour and presents a stunted yellowish appearance. While it is necessary for all vegetables it is particularly beneficial to green crops, and to those that depend for their ultimate development on the production in the early stages of a strong, vigorous leaf growth. On the other hand, a predominance of nitrogen would probably be more or less injurious to certain vegetable crops—such as those grown for their tubers, bulbs and seeds—the more so if the other plant foods are very deficient in the soil.

Sulphate of ammonia, nitrate of soda and dried blood are well-known nitrogenous fertilisers. Carefully used, they can be of great value in keeping young plants on the move and especially in producing luscious green foliage.

They act very quickly and should be used regularly and frequently in very small quantities, not in large doses at long intervals.

All nitrogen and no phosphate would mean a soft, leafy plant without strength to produce flowers and seeds or to reach maturity. It would do well for cabbages, spinach or mustard and cress, but not for many other plants.

Phosphates.—These play an important part in the early development and root growth of young plants. They have the power to counter-balance the excessive absorption of nitrogen from the soil, and tend to promote a sturdy, firm type of growth. Phosphates are closely associated with the formation of tubers, flowers, fruits and seeds. As phosphates are so important, and are usually lacking in soils, their liberal and regular use should be more generally adopted.

Phosphates are supplied by superphosphate of lime, bone, guano, basic slag and rock phosphates. They do not act quickly and their effects are not so obvious to the eye, but they do essential work.

Potash.—This substance is a balancing food; it has a steadying effect on the others and produces

quality, colours and flavours and does other useful work. Potash assists greatly in the development of thick healthy leaf growth, and is chiefly concerned with assimilation, and the production of starch, sugar, etc., in plants. It is especially beneficial to tubers, roots, fruits and seeds; it improves the quality and promotes early ripening and maturity.

Potash is supplied by sulphate of potash, potash salt and kainit; sulphate of potash being the best and safest for amateurs.

When prunings and waste vegetable refuse are burned, the ashes provide a valuable fertiliser rich in potash. These should either be immediately applied to the soil, or be stored in a dry place until required, as rain washes out the potash. The ashes are best applied on the rough surface of the ground after digging.

When it is necessary to give a complete fertilizer or manure, as in many cases, there is no better home-made mixture than superphosphate of lime 3 parts, sulphate of ammonia and sulphate of potash 2 parts each. In this fertiliser there is no chemical action that can inflict the least injury on the most tender plant.

All artificials can be applied in dry or liquid form. In the former case they should be rubbed through a sieve, to break up lumps, before application. It is a good plan to mix strong artificials like nitrate of soda, with sand to ensure even distribution.

Distribute the dressing evenly as near the plants as you can without actually touching them. If the soil is moist, stir in the manure to enable it to dissolve. Should it be dry, water immediately after the application.

The doses of each artificial are often clearly recommended by the makers but it will generally be found that 2 to 3 ozs. a square yard is a safe application. Alternatively, an ounce per square yard once a week is better than 4 ozs. once a month.

Liquid manure.—Liquid manure covers all manures, including artificial manures, which can be applied in liquid form.

As the roots of plants can only absorb food in liquid form it follows that crops will more readily respond to applications of liquid manure than to dry manure which must combine with rain or soil moisture before it is available as plant food. The chief advantages of liquid manure are quick and effectual action, economy and the fact that it may be applied at the time when crops will most benefit by it. There is also less danger in feeding plants with liquid than with dry manures, especially when highly concentrated and patent manures are used, but while it is safe to follow the makers' directions in the latter case, it is always better to give several weak doses than one which is very strong. This applies more to plants in pots and confined borders than to those planted in the open, and to crops of annual and less duration, than to those of perennial and arboreal character.

Liquid manure should vary in character according to the effect the grower desires to produce. If rapid growth is deemed necessary, a nitrogenous fertiliser such as nitrate of soda or sulphate of ammonia dissolved at the rate of 1 oz. in 3 or 4 gallons of water will be suitable; but guano employed in similar proportion has a more sustained effect and is of great value for pot plants of many kinds.

Superphosphate is not often applied in liquid form but if dissolved at the rate of $\frac{1}{2}$ oz. per gallon of water and given to plants in pots and borders wherever there is some accumulation of humus, it produces good effects.

Soot is doubly useful as it is in some respects an insecticide as well as a nitrogenous fertiliser; it is prepared in liquid form by placing 2 seers of soot (enclosed in a cloth bag or sack) in about 20 gallons of water giving it a stir round occasionally during the first two days. The soot water may be used at full strength for most plants.

All things considered, one of the most generally useful and suitable liquid fertilisers is made from fresh

cow manure. Put one cubic foot in a sack and place it in a barrel, then pour in 20 gallons of water and allow the whole to remain twenty-four hours before use; dilute with clear water to the colour of pale ale. A second 20 gallons of liquid can be made from the same manure, provided the latter is well stirred.

The sack should be suspended from a stick laid across the top of the barrel so that it can be plunged up and down as necessary to liberate the manures.

In the case of large gardens it will be found preferable to construct a special covered tank in which liquid manure can be continuously manufactured. Such a tank should prove of far greater value than large quantities of artificial manures, for if diluted to pale ale colour, the liquid is suitable alike for pot plants, the herbaceous border, the rose garden and the kitchen and fruit gardens.

(4) APPROACH ROADS AND PATHS

The approach roads which will be used by motor and other heavy traffic must be constructed to ordinary road specifications, *i.e.*, a soling (boulder) coat of 4"-6" depth and a wearing (ballast) coat of 3" to 4" depth, well consolidated and finished. If it is possible to bituminize the surface, it will be a great boon.

In addition to the approach roads to the house, even the smallest garden will need one or more paths to admit of convenient access to the outer limits of the garden. It is not possible to walk on the lawn when it is under water and if access to the work garden or vegetable garden is only by means of the lawn, the latter will soon show signs of wear and tear.

Apart from their utility, paths play an important part in the lay-out of a garden and each should serve a definite purpose. If a complete tour round the garden can be provided, its interest will be enhanced, but where this is not possible owing to limited space, a straight walk, flanked by shrubberies or flower borders, will seem to increase the length of the garden, especially if the path is narrower at the far end.

Winding paths can be very attractive, particularly when the curves are planted with shrubs and tall growing subjects so that the view beyond is hidden. This introduces an element of surprise but the curves must be graceful and serve a definite purpose. A path which turns and twists for no apparent purpose irritates—so does a path that is too narrow. As a general rule, main paths should be wide enough for two people to walk comfortably abreast.

Care should be taken in all cases with the levels, the paths being kept a few inches above the surrounding garden levels so as to admit of easy drainage of surplus water, thus keeping the paths dry and clearly visible.

Paths required for formal effect may be paved. For this purpose cement tiles or stone slabs of regular shape may be laid to formal design in lime or cement mortar with open joints.

Alternatively, an almost equally pleasing effect can be obtained by "crazy" paving. In this case the paving stones or slabs should be of irregular shape and may be laid either in mortar or in dry earth. In the latter case it is not a bad idea to first prepare the ground as for planting and then to broadcast grass seed or flower seeds in the crevices.

Other paths may be made of material locally used in roads but it will be found a recurring advantage if the soling coat is prepared of well-rammed stone or brick ballast of 3 or 4 inches depth. This will prevent the growth of weeds, which are a menace to paths and involve appreciable expenditure on constant weeding. Patent weed killers are available in the market for use on roads and paths but the use of these is expensive and unsatisfactory. It is wiser to depend on good foundation of paths.

Approach roads and paths should be neatly edged but on no account with bricks laid on end or with ornamental tiles that are designed to show above the surface. The latter, apart from being unsightly,

are a nuisance as they prevent the lawn being mowed up to the edge and collect all rubbish that may be blown about the garden.

If tiles of narrow width are available they may be laid on edge in straight lines flush with the surface of the path. If ordinary bricks are only available they should be laid lengthwise and sloped inwards towards the surface of the path until only one edge of brick is visible at the juncture of the path and lawn. Laid in this manner the bricks will serve the purpose of demarcating the paths and will not be an eyesore. A mason will have no difficulty in laying bricks in the manner suggested and the result will be found most satisfactory. It will be possible to mow the lawn right up to its edge and maintenance will be simplified.

The edging of the approach roads and paths should be kept flush with the roads and edges of the lawns.

As an alternative to keeping the edging of roads and paths flush with the lawn, the process described on page 76 may be adopted under which the turf edge will be about $1\frac{1}{2}$ inches above the road or path surface. The main level of the lawn, however, as previously advised should generally be lower than the level of the road or path.

(5) NURSERY AND "WORK ROOM"

However restricted the area of the garden, it is essential that a corner should be reserved for seed sowing, propagation by cuttings, transplanting and general "messy" work. The area so reserved should be sufficiently large to include nursery beds, seed beds, potting ground, manure heaps, manure pits, and, if possible, a tool godown and potting shed.

This area, which may aptly be termed the "work room" of the garden, may be fitted into any odd corner of the compound and should be as far as possible from the house. It is necessary that water should be conveniently handy as this will be needed for prepara-

tion of manures (compost, leaf mould and liquid) and for watering seed beds, nursery beds, etc.

The area should be shut off from the rest of the garden by a shrubbery or hedge and protected from hot and cold winds. While a certain amount of shade will be needed, it is essential that the seed beds and nursery beds should be open to the sky and sun and free from overhanging branches of trees and the action of their roots.

Seedlings and cuttings grown entirely in the shade are weakly and this results in heavy casualties at the time of transplanting, whether into pots or the open ground. On the other hand, seedlings and cuttings reared in the sun are strong and healthy and easily withstand transplanting. If the morning sun can be admitted to these beds it will be more beneficial.

Detailed instructions regarding the preparation of seed beds will be found in the chapter on Seedlings. The same or similar beds can be used for planting cuttings and other propagation work. A bed 20 ft. in length, and an area of 80 to 100 square feet, should meet the needs of most gardens.

In the chapter on Manures, detailed information has been given regarding the preparation of manure and leaf mould. Similarly, information regarding methods of propagation of plants will be found in the chapters on Shrubs, Hedges, Climbers, Roses, etc.

One last word—the “work room” should be kept scrupulously clean. Everyday, after the day’s activities have been completed, the *mali* should be compelled to sweep and tidy up, restoring everything and all odd bits of material to their place.

Cleanliness is a safeguard against many of the diseases to which seedlings and cuttings are subject.

(6) CUT FLOWER PLOT

A small area of ground adjoining either the vegetable plot or the nursery should be reserved for growing plants and annuals for cut flowers for the house.

The area preferably should be open to the sky and sun and free from overhanging branches of trees and the action of tree roots.

Plants in this section of the garden may be confined to a few hardy and free flowering rose trees, some decorative chrysanthemums, selected varieties of sweet peas, gerbera and suitable annuals in season.

The selection of varieties should as far as possible be made with due regard to the colour schemes used in furnishing the living rooms of the house.

Carnations and violets are favourite cut-flowers. Where these do not succeed in beds they should be cultivated in pots for cut work.

Beds for roses, sweet peas, gerbera and annuals should be prepared and the plants cultivated in similar manner to that recommended in the several chapters on the different subjects.

Chrysanthemums required for cut work may be grown in beds in the open if arrangements are made for a temporary movable shading which may be adjusted during the hottest hours of the day during the dry season and during breaks in the rains. It is of little use attempting this method of culture in the partial shade of trees, for the amount of shade necessary in the hot, dry weather will prove excessive during the cloudy and close days which occur in the rains and again later, when the plants commence to produce flower buds and require all light and air possible. A convenient and successful way to open-bed culture is to well trench the soil to a depth of $2\frac{1}{2}$ feet, each bed being about 4 feet wide. A fair quantity of old stable or compost manure may be incorporated with the soil, the bulk being mixed with the lower 18 inches of under soil. Excessive manuring of the upper soil will prove too strong for the plants during the hot weather and many will become sickly and die off. The surface of the beds should be raised a good 8 inches above surrounding levels with a drainage channel between each bed capable of carrying off the heaviest

storm water. The latter precaution is essential or heavy and prolonged rains will prove fatal to the plants. A 4 feet wide bed will accommodate two rows of plants which will be conveniently accessible for staking and disbudding. Chrysanthemums should be transplanted to the prepared bed in April.

To provide the necessary shade, three parallel wires may be stretched about $4\frac{1}{2}$ feet above the surface of the beds on which *sirkanda* or bamboo chicks, made to size, may be stretched as occasion demands. During hot, dry weather the chicks should be adjusted from 9 a.m., to 4 p.m. They should be kept rolled up during cloudy weather in the rains but immediately re-adjusted during breaks or the result will be disastrous.

During dry weather copious watering will be necessary and the margins of the raised beds should be banked up a few inches to permit this, but, as soon as the rains set in, the raised edges should be demolished and, if rain is steady and persistent, slightly reduced below the general surface in order to facilitate free and adequate drainage. Apart from these hints the plants may be treated much in the same way as pot plants. Having more root room they will require less feeding, but a certain amount of liquid manure may usually be given with advantage once the plants have reached an advanced stage of development. Disbranching and flower disbudding will of course be carried out, according to requirement, for blooms of medium size for table decoration. Both double and single varieties may be used for cut work but care must be taken to select suitable colours and vigorous plants. With proper facilities, some of the finest exhibition blooms may also be raised in this way and the owner who adopts this method has the advantage of not having to spoil his pot plants when selecting cut blooms for Show purposes.

(7) POT PLANTS

There is no branch of gardening in India that is more overdone in the plains than pot plants. There is

scarcely a house or compound that is not belittered with far too many poorly kept and untidily arranged flower pots. Nothing is so distressing as to see the effect of an otherwise nicely kept garden entirely destroyed by lines of flower pots along roads and paths.

Among other disadvantages, pot gardening is expensive and takes up a considerable portion of the time of the *mali*. Considering all the circumstances, it is recommended that pot work should be restricted to a minimum.

A certain number of plants in flower pots are needed of course for occasional use in the house and for decorating the verandahs and immediate surrounds of the building. For this purpose it will suffice to grow plants that thrive and show off to advantage in pots, such as crotons, coleus, and dwarf evergreen foliage plants consisting principally of ferns, palms, *aspidistras*, *draccænae* and *asparagi*.

These plants can be used throughout the year for decorative effect on the sides of the building not exposed to the full force of the sun and are useful also indoors. For areas exposed to the sun a limited number of selected seasonal annuals, including single flowering and hardy chrysanthemums, may be grown in pots for arrangement in colour schemes.

The most successful varieties for pots are marked with an asterisk in the chapter on Flowering Annuals.

These pots should suffice for both decoration and utility purposes but, in addition, if the tastes and means of the owner warrant it, chrysanthemums, carnations and annuals may be grown in pots for exhibition at public Flower Shows. Cultivation for exhibition purposes needs much study and experience. The subject cannot be covered in the small space of this book.

In addition to foliage plants and annuals, polyantha roses may be grown very successfully in pots and make a good show.

During the "growing" stage, flower pots should

be kept in an out-of-the-way corner of the garden and only moved into prominence when in bloom or when fully developed. Evergreens and plants requiring shade can be cultivated in the early stages in the Nursery or under the shade of trees. Annuals and sun-loving plants can be grown conveniently on the roof of the building or outhouses where they will receive all the sun and warmth they need for early growth.

The preceding remarks of course do not apply to hill stations where because of restricted areas of ground available for gardening it is usual to depend a good deal on pot cultivation. In hills in addition to ferns and evergreen plants it is possible to grow a choice selection of beautiful flowering plants in pots such as geraniums, hydrangeas, fuschias, begonias and other fibrous rooted and bulbous plants.

Pots are made in many shapes and sizes but the ones most commonly used are the upright and the flat—the latter being known as pans.

Pans are useful for sowing seeds and for dwarf growing plants such as dwarf petunias, branchycome, nasturtiums and pansies, which look best when grown in massed effect and arranged along steps or the edges of raised verandahs.

The tendency to use large pots should be resisted. Nothing looks worse than a small plant in a large pot. The ideal pot plant is one that when fully developed completely obscures the earth and upper outline of the pot. A point also to be remembered is that plants intended for use indoors should be grown in pots that will fit in pot stands and brass holders.

It will be found that pots varying in size from 8" to 10" are generally most suitable for ornamental pot work.

All new pots should be well soaked before use and all previously used pots should be well washed and scrubbed before being used again.

For all general purposes the best soil for pot work

consists of equal measures of loam (good garden soil) and leaf mould or compost manure. If the loam or garden soil is heavy a small quantity of coarse sand can be added with advantage.

The use of animal manure in the original potting soil should be avoided; such manure can be added later, when the plant is well established, in the form of a top dressing of liquid manure. Alternatively, well established and root-bound pots may be given a top dressing at intervals of 2 to 3 weeks of comparatively fresh horse manure. Nature lays manure on top of the soil and this is a safer rule to follow than putting manure into the soil.

Charcoal will be found very beneficial for pot plants. A handful of lightly crushed charcoal should be mixed with the soil of each pot—"sweepings" of charcoal suitable for this purpose can be bought quite cheaply in the bazaar. Similarly, a handful of smashed lime rubble may be added with advantage to the potting soil.

In filling pots with soil, arrangements should be made for drainage and about a quarter of the depth of each pot should be filled with broken crocks.

On this place a layer of cocoanut fibre or, if this is not available, of course dry leaves, and then fill with soil.

When transplanting, the plant with its soil should be held in position and the pot gradually filled in from the sides with soil which should be pressed down firmly as the operation proceeds.

Seedlings intended for pot plants should be given a start in 3" pots and potted on into larger pots as need arises. When potting on do not remove plants to a much larger pot: a size bigger is all that is required. When roots begin to show in the drainage holes at the bottom of the pots it is time to shift the plant to a larger pot.

A certain quantity of soil is consumed in the form of nourishment by the plant while other portions are

washed away in drainage. It is therefore necessary to re-pot evergreen and perennial plants at least once a year, even though they should not have outgrown the size of the pot.

Alternatively, surface dressing may be resorted to with advantage. In this operation a portion of the old surface soil is removed and replaced by fresh rich compost.

Watering is a very important operation in the cultivation of pot plants. If left to his own devices, the *mali* will give each pot a soaking morning and evening. Heavy watering is, however, injurious and no pot should be watered unless the soil actually requires it.

The following are the main factors which affect watering. The trained eye can gauge them automatically.

(1) *Texture of the soil*.—Normally, of course, a heavy soil holds water better than an "open" or light soil containing a large proportion of coarse particles, such as sand. Under ideal conditions water is present round the particles with air in the tiny spaces between, so that the roots may breathe. Too close a texture or too much water drives the air from these spaces and the roots are more or less suffocated.

(2) *Type of leaf*.—The character of the leaves of a plant has an enormous influence on its thirst. Thick, leathery, waxy or hairy leaves on a plant show that it requires less water than a plant with large thin leaves.

(3) *Ratio of leaf surface to size of pot*.—This sounds difficult but all it means is that a plant with a large leaf surface in a small pot will obviously require more water than a plant with two or three small leaves.

(4) *Amount of roots*.—When the roots have taken possession of all the soil in the pot—a condition which gardeners describe as "pot bound"—more water will be required.

(5) *Period of growth of plant*.—A plant in active or full growth will use more water than one at rest.

(6) *Atmospheric conditions*.—Plants in a moist, still atmosphere will use up less water than those in a dry, moving atmosphere. For instance, pot plants or vases of cut flowers wilt quickly in a draughty room.

When a pot really requires watering a hollow sound will be emitted if it is tapped against the side with a knobbed stick.

Watering should be done preferably in the mornings. When a second watering in the day is necessary, care should be taken not to water while the soil and leaves are yet warm from the effect of the sun. This watering should be done very late in the evening.

Foliage plants may be syringed freely with great advantage but this should only be done after the sun has gone down or very early in the morning. Otherwise the heat of the sun is inclined to burn the foliage.

When pot plants are used for room decoration it is always best to remove them outside at night. In no case should they be kept for too long a period indoors.

Pot plants must be watched throughout the various seasons and attended to as circumstances dictate.

During the winter months growth of foliage plants is more or less at a standstill and watering should be restricted to a minimum. The more tender kinds of plants will require a sheltered position in a south verandah; the harder kinds will take no harm from exposure to direct sun provided they are gradually hardened to it.

During spring, with warm nights and days, foliage plants resume activity. They should be removed from positions where exposed to direct sun. Repotting and propagation, whether by seed, division or cuttings, may now be proceeded with.

In re-potting, the outer layer of old soil should be teased carefully from the surface and from round the sides of the ball by means of a bluntly pointed stick, the old drainage crocks removed and fresh clean crocks

substituted. The pot should be well scrubbed in water to clean out the pores and the plants replaced, carefully ramming fresh soil round the ball by means of a blunt, stick. After replanting, keep the plants in a cool, shady position away from the breeze, and keep the surrounding surface of ground well watered for the sake of atmospheric humidity which is almost as important as root moisture. Overhead syringing morning and evening will also aid growth.

The hot weather in the plains is the most trying season for foliage plants in pots. Keep them on an absorbent surface and water freely between the plants for the sake of atmospheric moisture. If the garden lacks natural shade and the plants are kept in a north verandah, the pots should stand on an inch of coarse leaf mould or other similar material that will keep moisture between them. Syringe well early morning and late evening and water freely at the root as with the dry atmosphere there is little risk of over-watering. The hardier kinds such as *asparagus*, palms, *aspidistras*, *chlorophytum*, hardy ferns, etc., will benefit by a weak solution of liquid manure every two weeks, but this must not be exceeded while the hot, dry weather lasts. Plants divided and re-potted in the spring will not require liquid manure till the rains are on and a congenial atmospheric humidity brings on active growth.

During the monsoon foliage plants are generally at their best but special care must be taken to prevent over-watering. This may lead to soil sourness which is fatal to vigorous and healthy growth. Re-potting that was not done in the spring can be completed in the monsoon. The procedure should be similar to that previously described.

(8) VEGETABLES

Planning and Choice of Crops

Before embarking on the task of laying out and preparing a vegetable garden it is necessary to determine what vegetables one will grow and in what quantities they are needed.

The choice of crops is largely a matter for the individual. Tastes differ widely and a gardener will perforce grow the things he likes best.

If good vegetables are available locally, or if other circumstances do not justify having a vegetable garden on elaborate lines, it will suffice to grow lettuce, celery, tomatoes and other choice winter season crops of which there is almost a daily demand. It will be found hardly worth while growing any but the very choice hot weather vegetables.

The notes in this chapter cover practically all varieties of vegetables and other crops cultivated and grown as vegetables but it is not necessary that every vegetable garden should include all these varieties.

For all general planning purposes vegetable crops broadly may be classified as follows:—

- I. Essential winter season vegetables.
- II. Summer season vegetables.
- III. Miscellaneous crops such as potatoes, strawberries, cape gooseberries, etc.

Separate areas or plots in the vegetable garden should be provided respectively for winter season vegetables, for summer season vegetables and for miscellaneous crops. It is of course possible to grow winter and summer season crops in the same ground but this practice is to be deprecated as it makes too great a call on the soil and interferes with proper rotation of crops and manuring of the soil about which more is said later on.

Area and Location.

An area of about 2000 square feet will provide ample scope for growing essential winter season vegetables for the needs of a small family. An additional

area of about the same size will be needed for summer season vegetables and miscellaneous crops such as Potatoes, Jerusalem Artichokes, Cape gooseberries and Strawberries, if it is decided to cultivate these crops.

The vegetable plots preferably should be rectangular in shape and fully exposed to the sky and sun. It is important that the rows of all vegetable crops should run North and South, or as nearly so as possible, with a view to utilizing to the utmost sun, heat and light. This arrangement promotes rapidity and quality of growth and early maturity in the crops; it also conduces success to any intercropping that may be attempted. The rows should run in parallel lines across the narrow width of the rectangular plots, which should therefore be laid out East to West in their length. The plots should be located as far as possible from trees, the root action and shade of which retard both vegetables and flowers. If there is no alternative but to place the garden near trees, the adverse root action of the latter can be minimised by digging a deep trench between the trees and vegetable plots and severing the spreading roots of the former.

The areas should be protected by a fence to prevent pilfering, and by a hedge to protect the crops from hot and cold winds. A combined fence and hedge of *Inga dulcis* or *Acacia modesta* will serve the purpose admirably.

Directions for planting such hedges will be found in the chapter on Hedges.

A wide path should surround the vegetable garden on the inner side of the hedge and another should run between the main plots.

Shrubs should not be planted too near the vegetable garden as they harbour birds which do much

damage to vegetables in their young state. This advice should not be interpreted to mean that the vegetable garden should be placed in an entirely open waste. A certain amount of vegetation in the neighbourhood of the garden is desirable as this provides food and homes to birds, frogs, lizards and lively insects which help to balance and check the peculiar excess of any one from constituting a pest.

Preparation of Ground.—The successful cultivation of vegetables needs adequate ground preparation, consisting of trenching and manuring.

Trenching is necessary to maintain a root range of 2 feet. This involves mock trenching or full trenching once in 3 or 4 years. There is no need to do either more frequently.

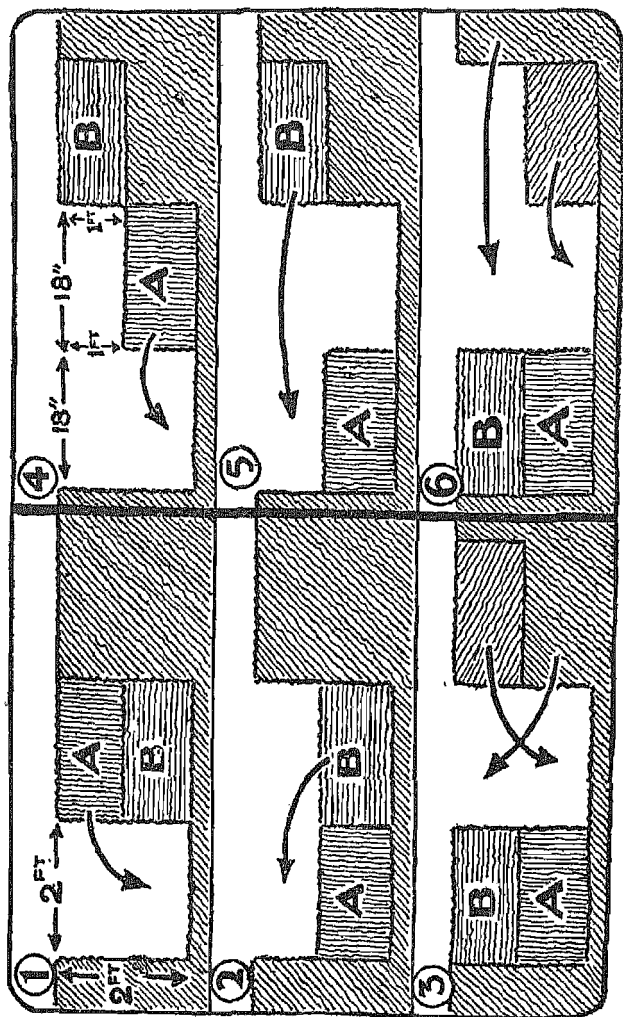
If the vegetable plots are divided into separate units to admit of the rotation of crops, as is recommended later in this chapter, trenching can be suitably regulated each year.

Whether trenching or mock trenching is the more appropriate depends on the nature of the subsoil; that is, the layer that lies below the top 1 ft. level. If this is clayey, shaley or in any respect obviously inferior to the surface soil, it is correct to mock trench.

If, on the other hand, there is no apparent difference between the colour and general make up of the two layers, full trenching will benefit the garden immensely.

There is an appreciable difference between trenching and mock trenching. In trenching the original top soil is buried beneath what was originally the subsoil, while in mock trenching the original top remains on top and the original bottom soil below it.

The two processes are described in the following diagrams:—



In *trenching*, a preliminary trench having been opened, the top spit of the next strip is dug over into the trench (1) to be covered by the bottom spit (2), the whole plot being treated in this way (3).

In *mock trenching*, a preliminary two-step trench is taken out (4), to permit the lower spit to be moved forward (5), and covered with the top spit from the adjoining strip (6), the operation resulting in the formation of another two-step trench, digging proceeding thus until the plot is finished.

The soil dug from the first trench has to be carried over to the last trench and in order to save carriage it will be found convenient to work in lengths of 30 feet.

Trenching completed, the area should be levelled in order to facilitate irrigation and conserve water. There should be ready means of drainage into surrounding low ground or drains in order to prevent water logging in the case of heavy rain.

Liming.—The soil should be tested in accordance with the directions given in the chapter on "Liming" and if there is need for lime treatment it should be provided.

Manure and Fertilisers.—After the ground has been initially trenched or mock trenched in the manner described above, it should be manured. Different varieties of vegetables need different manurial treatment but as initial treatment and when dealing with virgin soil, it will suffice if about 4 inches of farm yard manure is worked into the soil after it has been trenched. One-half the quantity used should be added to the bottom spit and one-half to the top spit. If compost manure is available it may be used. It will be an advantage and labour saving if manure is added to the bottom spit of soil at the time that the ground is being trenched. The remainder of the manure may be spread evenly over the surface and well mixed with the upper 12 inches of freshly trenched soil. The surface should then finally be levelled.

If there is a shortage of compost or farm yard manure, green manuring may be adopted with advantage. The method of doing this is described in the chapter on Manures.

After the first season it should only be necessary to apply a top dressing of 2 inches of farm yard or compost manure and to mix this well with the top spit of soil.

The ground should be finally prepared and irrigated at least 6 weeks before it is required for planting.

With a ground that has been properly prepared and treated with farm yard or other organic manure it should seldom be necessary, in addition, to use artificial fertilizers. A guide to applying fertilizers when needed will be found in chapter VIII (3) which deals with this subject.

Seed Sowing and Planting.—To avoid failures and disappointments it is important that seeds and tubers of good quality be purchased and from a reliable source. The use of acclimatised seed should be restricted to a minimum.

Adequate instructions regarding the sowing of seed will be found in chapter IX 4(a). If these directions are followed carefully the results should be satisfying.

Succession of Crops.—Care should be taken to provide a steady succession of crops. Gluts are a reproach to any gardener.

In order to secure succession of crops, the seed of broccoli, cabbage, cauliflower, lettuce, carrot, beet, turnip, radish and other varieties should be sown in small quantities at intervals of a fortnight or ten days and transplanted at similar intervals. Normally, if a dozen plants are transplanted or a drill of 25 ft. sown with seeds situated at short intervals it will provide an excellent succession of vegetables for the family larder.

The use of early and late varieties of cauliflowers, cabbages, peas, leek, celery, etc., will also help to secure a succession of crops.

Two Tables (annexures A and B) are appended to this chapter which show the approximate quantities of seed required, the depths at which to sow, the dates

of sowing and other useful information connected with the cultivation of different crops.

These tables should be consulted when planning the garden, ordering seed, sowing seeds and planting tubers.

Inter-cropping.—This may be defined simply as the growing of two crops simultaneously on the same piece of ground. Much might be done in this direction in all gardens, provided that over-crowding is avoided, as this would be distinctly harmful, and would defeat the object in view.

The spaces between the rows of slow-growing main crop vegetables should as far as possible be sown or planted with kinds of quick growth and early maturity. Combinations of tall and dwarf growing crops may also be made.

Some suggestions are given for inter-cropping in annexures A and B.

Maintenance.—Throughout the growing period, care should be taken to keep the vegetable garden well cultivated and hoed and free of weeds and decaying vegetable matter.

Irrigation should be sparingly done; $\frac{1}{2}$ in. (see also Chapter IX (1), Irrigation) a week is ample in the plains and this should be supplemented occasionally by spraying the plants with clean, fresh water.

In order to facilitate irrigation the vegetable plots should be divided by slightly raised earth bunds into reasonably sized beds; different crops should be kept separate in this process so that any one crop can be irrigated at one time.

Such crops as peas and beans should be gathered immediately they are fit for the table. By so doing the plants continue to bear much longer.

If need arises, artificial manures and liquid manure may be used for growing crops in accordance with the directions in the chapter on Manures. If the initial

treatment is correctly carried out it will seldom be necessary, however, to resort to artificial manures.

Further directions on this subject will be found in annexures A and B.

Staking.—Vegetables of climbing habit such as Peas, Beans and Cucumbers need to be supported in order to bear fruit properly. The method suggested for staking sweet peas in chapter VII (5), with advantage, may be followed for these vegetables.

Vegetables of the Pumpkin variety are too heavy to be supported in this manner and may be trained up the walls of outhouses or on tree trunks, etc.

Essential Winter Season Vegetables.—In allocating vegetable crops attention should be paid each year to carrying out as far as possible a sound system of rotation, based on the food requirements of crops and the effects which the growth of each produces on the soil. This is an important factor for continued success in vegetable growing; and both general experience and special experiments prove that it is not good practice to grow the same kind of crop or crops requiring the same manurial treatment, on the same ground, year after year. This practice, if persisted in, causes far-reaching changes in the chemical composition of the soil and alters its behaviour with regard to the crop it carries. There must be a constant drain upon the soil resources along the lines of the special requirements of that crop, annually reducing to a minimum certain essential plant foods, while others accumulate to a wasteful and harmful degree.

Vegetables should be arranged in groups, and each crop, or group of crops, should be followed by one making somewhat different demands on the soil, and leaving it in the best condition for its successor. This is the fundamental principle in all rotation of crops, which, if carried out intelligently, will keep the soil in a better balanced condition, improve the quantity and quality of the crops, increase the returns from manures applied, and reduce the risk of attack by

insect pests and fungoid diseases.

The following table, in which only the principal winter season vegetable crops are included, will act as a guide in carrying out a system of rotation.

Pod Bearing Crops	Green Crops	Root Crops	Bulb and Stem Crops
Crops requiring chiefly Phosphates and Potash.	Crops requiring chiefly Nitrogen and Phosphates	Crops requiring chiefly Nitrogen and Potash.	Crops requiring the three in more equal proportions.
Peas Beans	Cabbage Brussels Sprouts Cauliflower Lettuce Broccoli	Beet Carrot Parsnip Radish Turnip	Onion Leek Celery

Tomatoes which are excluded from this list can be fitted in with any group as space is available. They should not be grown in successive seasons in the same ground.

Potatoes, Jerusalem Artichokes and other crops which require comparatively large areas of ground are omitted from consideration as it has been suggested they might be grown in a separate plot of the garden.

The plot set apart for winter season vegetables might be worked in three sections: all the green crops being grown together in one section; the root, bulb and stem crops in another section and the pod-bearing crops in the third section. The following year the green crops would be moved along to follow the root, bulb and stem crops; the latter would take the place of the pod-bearing crops, which in turn would succeed the green crops. The space between plants and rows required for each variety is clearly set out in annexure A and this should be used as a guide in drawing up the planting plan.

Celery and Leek should be planted in trenches prepared in accordance with the special directions for these crops. All other vegetables should be sown or planted in slightly raised drills.

A simple rotation of the sort proposed and which could readily be varied to suit the different quantities of particular classes of crops grown will suffice in small gardens.

If Potatoes and Jerusalem Artichokes are grown, it can be arranged in successive years to move one or more of the above group of crops to the areas occupied by the above listed vegetables and to transfer the latter to the vacated ground.

Special Notes.—Brief cultural notes are given regarding the following winter season vegetables which need more or less special treatment:—

Tomato.—This is a succulent annual, said to be a native of South America, and is grown for its fruit which, when ripe, is much esteemed in salads, for making sauces and for flavouring soups. The varieties in cultivation are numerous, but as nearly all attain perfection in this country, it is not of material importance which variety or varieties are chosen.

The seeds should be sown broadcast, in beds, made up in an open situation, from the middle of July to the end of October, and the plants when a few inches high, planted in the open ground in any kind of good soil. In districts where frosts seldom or never occur, the plants may be planted in an open exposed situation, in rows 3 feet apart and $1\frac{1}{2}$ feet between the plants, but in Northern India, where frosts are of annual occurrence, they should be planted in a sheltered situation and closer together. A good method of planting for cold districts is to place the plants out in sets of 3 rows, allowing $1\frac{1}{2}$ feet between each row, 15 inches between each plant, and a space of 3 or 4 feet between each set of rows as a pathway, and when frost is prevalent, or when the nights are exceptionally cold, provide cover every evening with mats or grass tatties until the weather becomes mild.

All further attention is confined to weeding when needed, and watering about once in ten days when the weather is dry. Superfluous growths must be

cut away so as to allow of a free circulation of air in order to prevent damping during wet weather.

Tomatoes when grown in damp conditions are liable to Rust Disease. This begins by the formation of yellow leaf blotches and ends by the plants being covered with a dirty white mould. In order to prevent and destroy this disease, spray with Bordeaux Mixture at the earliest evidence of it.

If two sowings are made, one in July and one in September or October, fruit may be had in season on the plains from October to July, providing of course that protection has been attended to during the colder months in cold districts.

At hill stations, sowings may be made during the spring months, and the plants when large enough to handle, planted out in well-drained ground at the distances apart given for warm districts in the plains. The spot chosen for growth should be sheltered from winds but not shaded from the sun.

Celery.—Early sowings should be made in pots or boxes, and sheltered from the sun and heavy rain in a well lighted shelter. When the young plants are a few weeks old the pots or boxes should be gradually exposed to full sun, and when thoroughly hardened, transplanted from these to a nursery bed 3 inches apart each way. When the plants have attained a height of 4 or 5 inches, they are ready for being placed out in their permanent quarters.

Late sowings or sowings of seed made after the rains may be made broadcast in seed-beds, and transplanted direct from these to their permanent quarters.

When the weather is hot, seeds often take a fortnight to germinate but when it has cooled down somewhat germination occurs in the course of a few days.

Celery will grow in any good soil but it thrives best in a rich, friable, and well drained loam. Celery should be grown in trenches 24" wide, 12" deep and 4' apart from centre to centre. The trenches should

be prepared some time in advance, each trench being made 2 feet wide, and the soil to a depth of 1 foot taken out and placed along each side. The exposed surface should then be dug to a depth of one foot. Afterwards a surface dressing of 3" to 4" of farmyard or compost manure should be added and well mixed with the soil. Tramp the bottom of the trench lightly to firm the soil and manure. Plant two rows 12 inches apart and 6 inches from the sides of the trench, allowing about 9 inches between the plants in the rows. After planting, give a dusting of soot to the soil around the plants.

During the early stages, water should be freely given, the surface soil frequently stirred and loosened, and all lateral shoots removed as they appear.

Feed with weak liquid manure when the plants are growing freely and apply periodically a light dusting of sulphate of ammonia.

When the plants are about one foot high or nearly full grown, remove all the short outer leaves they possessed at the time of planting, draw the remainder closely together with the hand, and bring a few inches of earth up to their base and repeat the process at intervals of a week until nothing but the leafy tops are visible. Care should, however, be taken not to earth up too high, and thus bury the plants. When the operation of earthing up is completed, the soil should be not much above the middle of the leaves or crown of the plants.

A mistake frequently made is to earth up as soon as the long leaves begin to develop; this not only checks the growth and renders the plants weakly, but makes the Celery tough.

After cultivation is confined to irrigating the spaces between the rows about once a fortnight, and keeping the ground free of rank weeds.

The heads are generally sufficiently blanched for use within a fortnight after the last earthing up has been done.

The treatment required at hill stations is exactly the same as has been described above, substituting the spring for the autumn months as the season of sowing. If protection can be given, the seed may be sown earlier in boxes in cold frames.

Leek.—This plant is cultivated for its fleshy stem, which when blanched, forms a flavouring ingredient for soups and stews. It succeeds fairly well in this country, often remaining in good condition for use until near the close of the rainy season, but seldom attaining so large a size as in Europe. There are numerous varieties in cultivation.

Leeks may be successfully grown in any good garden soil that is deeply worked and liberally manured; like the onion, this crop thrives best in soil containing an abundance of humus.

The seeds should be sown broadcast in seed beds from the middle of September to the end of October. When the young plants are 4 or 5 inches high, they should be planted out in narrow shallow trenches. The latter should be made 4 inches wide, 6 inches deep and 15 inches apart and the plants inserted down the middle of the trench at 8 inches asunder. For a month or two after planting, the plants should be allowed to grow in natural manner, but when well advanced, a little earth should be drawn into the trenches, and the operation repeated until the trenches are filled up. Afterwards, nothing further requires to be done beyond weeding when needed and watering once a week when the weather is dry.

The fleshy stems are usually in fit condition to use a few weeks after the last earthing up has been given.

At hill stations, the treatment required is the same as detailed above, only substituting the spring for the autumn as the season of sowing.

Miscellaneous Crops.—The principal varieties falling in this class are Potato, Jerusalem Artichoke, Globe Artichoke, Asparagus, Strawberry, Cape

Gooseberry, Rozelle (Red Sorrel), Rhubarb and Mushroom.

Short cultural notes are given with regard to each of these crops:—

Potato.—The best soils for this crop are those of a loamy to sandy nature, and the worst are heavy wet clays or peat. The lighter, drier, and warmer soils produce larger and sounder crops of better quality and flavour. However, with good drainage, and deep, thorough cultivation potatoes may be successfully grown in practically all kinds of soil.

Potatoes for planting require to be carefully selected from the best and strongest plants if the vigour and productive powers of the variety are to be maintained. It has been abundantly proved that immature seed potatoes give the best results, promoting in the next season earlier and more vigorous growth and increased yield. This also encourages the earliest possible maturity of a particular variety. Only sound tubers, clean and free from disease, should be used for seed.

The size of the tubers is also important. Too small potatoes should be avoided for seed, nor is it advisable or economical to use very large ones. Tubers approaching medium size are best: those from $1\frac{1}{2}$ to 2 inches in diameter, planted whole, have generally proved the most profitable for this purpose.

Various distances at which to plant have been advised and put into practice, with varying degrees of success. With due regard both to the welfare of the crops and economy of space, the following distances have from experience been found suitable for garden purposes, and for different varieties:—

Early varieties, 22 to 24 inches between the rows, and 9 inches between the sets.

Main-crop varieties, 30 inches between the rows, and 15 inches between the sets.

A good average depth at which to plant the

tubers is 5 inches, 4 inches being deep enough in stiff clay soil.

The ground having been trenched or dug and manured some time in advance in accordance with the general directions given earlier in the chapter, the first thing to do in commencing to plant potatoes is to level the surface. A line should then be placed in position for the first row, and an open drill 4 to 5 inches deep taken out with the draw-hoe, or a spade may be used if preferred. A number of drills may thus be made; the potatoes being afterwards planted in the drills at the proper distance apart, and covered in, leaving the ground level but not too fine on the surface.

Another good plan is to set the line, and by means of a spade held with its back to the line, make holes 4 to 5 inches deep and at the required distances in the rows. The tubers are then planted in the holes and afterwards covered in, as in the first method. A variation of the second mode of planting is that in making the holes in one row the soil taken out is thrown into the holes in the previous row containing potato tubers. In this way holes are formed in one row, and the tubers planted in the preceding one are covered in, all in one operation. It only remains to take the soil level in finishing the work.

Either the open drill, or holes made with the spade as described above is a better and more expeditious method than dibbling in the tubers, as is often done, but which has many serious disadvantages..

The tubers should not be planted in an upright position, but should in all cases be placed on their sides, with the buds or sprouts pointing along the drill in the same direction, preferably northwards. This position of the tubers tends to delay the appearance of the plants above ground, which is often a distinct advantage as it secures a greater length of stem below ground, and consequently a greater production of early roots on which the crop is formed later.

When the plants are well above ground, and the rows are distinctly seen, the soil should be cleaned and made free from weeds.

The ground should then be well forked and loosened between the rows, and to some extent between the plants, the full depth of the digging fork. The soil, however, should not be turned over, but allowed to fall back into its former position, so as to retain moisture and keep the moist soil along with the manure underneath instead of exposing it on the surface. Run the digging fork through any large clods to break them up and then level the surface. This important operation provides the loose, free-rooting conditions which are so beneficial and natural to the potato plant, promotes rapid growth and a branching extension of the root system resulting in increased tuber formation. It also facilitates the earthing up of the rows later. In the case of stiff soils, a second forking between the rows a week or so before earthing up is advisable.

Early varieties that are soon through the ground are better to have some fine soil drawn up over the shoots in the early stages as a protection against late frosts. But the final earthing up of all varieties should be done when the plants are 6 to 8 inches high. This should be done so as to form broad, well-formed drills with a good bulk of soil along each side. Drills of this sort are better able to hold moisture and heat and later in the season reduce the risk of injury to the tubers through exposure to the air and to disease spores. Avoid making narrow drills that run up to a sharp ridge at the top. Keep the drills clean by hand weeding until the time arrives for lifting the crop.

Water freely during growth, but when the crop is nearing maturity, which is known by the yellowish hue the leaves then begin to assume, it is sparingly given, and entirely withheld when the leaves begin to wither. When the leaves including the haulm are quite withered, the crop is dug and stored away in a dry place for use during the summer.

Jerusalem Artichoke (Hathi Chuk).

This is a hardy tuberous-rooted perennial, a native of North America. The roots are a popular vegetable, and are prepared for the table in various ways.

The plant thrives with little attention and is raised by planting the tubers or sets, as they are termed, 3 inches deep, in any good soil, in rows $2\frac{1}{2}$ feet apart, and one foot between the sets during the months of March and May. When the shoots have attained a height of about a foot, the rows should be earthed up in the same manner as a potato crop. All after attention primarily consists in keeping the ground free of weeds, and irrigating between the rows about once a week during dry weather.

The tubers are ready for use in September, but are not fully matured until the commencement of December. When quite ripe, they may be dug up and stored in dry sand, but if the plot is not required for another crop they should be allowed to remain in the ground and dug up for use as required, as they preserve their delicacy of flavour and keep better when undisturbed.

The treatment required at hill stations is similar to that described above but planting should be done between the middle of February and middle of April.

Globe Artichoke.—This is a perennial plant and is a native of the north of Africa and south of Europe. It is cultivated for the immature flower heads, of which the fleshy receptacle and base of the involucreal scales are the parts used. It is a delicious vegetable and is deserving of greater popularity. The flower heads should be cut before any seed has been formed. It thrives in most parts of India with little attention and when planted in well drained ground, will live through the heat and damp of summer.

The artichoke is best raised from imported seed in the plains. It is sometimes propagated by taking offsets from old plants and planting these in autumn and from acclimatized seed but the heads produced

from such plants, although obtained in greater abundance, are individually not so large as those obtained from imported seed.

When raised from seed, the latter should be sown broadcast in well drained seed beds, covered with about three-fourth of an inch of fine soil, between the middle of August and end of October.

When the young plants have made three or four secondary leaves, they may be replanted in the open ground in rows 4 feet apart each way.

The best soil is a loose, deep, sandy loam, but the plants also thrive in heavier soil. Before planting, the ground should have been deeply dug and enriched with a liberal application of farmyard and compost manure.

If sufficient manure is not available for application to the whole area of ground, holes 2 feet wide and $1\frac{1}{2}$ feet deep, may be dug 4 feet apart and refilled with soil mixed with two or three basketfuls of manure. The seedlings should be planted in these holes.

After-attention consists in keeping the ground free of weeds, occasionally cultivating the soil between the plants and watering about once a fortnight when the weather is dry.

At hill stations, the seeds should be sown, or the offsets taken off and planted during spring. As the artichoke does not degenerate in a cool climate, a plantation, when once established in the hills, may be renewed with success from year to year by offsets.

Asparagus.—(Marchuba, Paragas.) This is a hardy perennial and is grown for the immature shoots which are greatly esteemed as a vegetable. It grows readily enough in most parts of India but the produce, with the exception of that grown in hill stations, is not comparable with that of Europe, the shoots being thin and weak, and deficient in flavour. In rich, friable, well drained soil, a fair degree of success is attainable with the cultivation of this plant, but when the soil is heavy and stiff, the produce is practically worthless.

The seeds should be sown broadcast in nursery beds, and covered over with half an inch of fine soil, from the beginning of September to the end of November. When the young plants have made shoots 9 inches or a foot long, they should be taken up and planted in their permanent quarters in the open ground in beds which should be prepared in accordance with the following directions.

Spread over the surface of the beds to a depth of 6 or 8 inches farmyard manure and compost in equal proportion; then dig over to a depth of 2 feet, taking care to thoroughly incorporate the manure with the soil during the operation. Allow the ground to settle down for a week or two, then lay it out in beds 5 feet wide, and of any desired length. After the beds are ready for the reception of the plants, remove the latter from the seed-bed and replant them in the beds prepared for them, in three rows, 15 inches apart, and one foot from plant to plant. When transplanting care should be taken not to injure any of the roots, which should be spread out in wide but shallow holes, and covered over with 3 inches of rich friable soil. Water immediately after planting, and water regularly during dry weather.

During the first two years, the plantation should be encouraged to throw up as many shoots as possible, as good overgrowth means a correspondingly good undergrowth of roots, and the latter when plentifully produced mean strong healthy free-bearing crowns.

The beds should be top-dressed once a year with farmyard manure and a sprinkling of common salt and the soil lightly dug over with a fork. Late December or January is the best time to perform this operation. After it has been completed, water should be freely given and in March, when the young shoots begin to appear, the best of these may be cut for use and the weak ones allowed to grow up; provided of course that the plantation is sufficiently advanced to be cropped. Too early cutting is responsible for many failures to grow good asparagus in this country. The

plants should be grown on as strongly as possible for at least two seasons before any shoots are taken.

A second crop can be forced on towards the close of the rains by cutting down the summer growth of shoots, and forking in a light dressing of manure, but this is a weakening measure, and should not be adopted if it is desired to preserve the plantation in a bearing condition for a series of years.

The duration of a plantation in a profitable condition will greatly depend on the soil, and attention given. If the former is suitable, and if the cultural details are carefully followed, five to six years is not too long a period to expect fairly satisfactory results.

The treatment required at hill stations is the same as in the plains, but the young plants may be allowed to remain for a year in the seed-bed before transfer to the open ground. Sowing and planting should be done in the spring months, or as soon as possible after all danger of the occurrence of hard frosts is over.

Strawberry.—This is a dessert fruit but is usually cultivated in the vegetable garden.

The garden strawberry, as found in India under good cultivation, is a scarlet conical-shaped fruit, of medium size, as compared with good home-grown fruit, and with the exception of those produced in the hills, not quite up to the latter in flavour, but the fruit grown in the neighbourhood of Meerut is equal both in size and flavour to much of the fruit in the open market in England.

The strawberry, though a perennial, is treated on the plains as an annual and is usually cultivated by planting young runners or young plants from the middle of October to the end of November and sometimes during December. These plants bear fruit in the following March and April and in some seasons well into May. The young plants are either procured from the hills or obtained from a strawberry bed on the plains which bore fruit in the spring. In some

seasons on the plains, particularly when the monsoon rains have been heavy and the strawberry patch often water-logged, the old plants and young runners die out. When this happens, fresh supplies of young runners have to be procured from the hills or from a neighbouring district where rainfall has been lighter or where drainage may have been better. As a rule, it is possible to save sufficient young runners on the plains until the planting season in October by selecting a well-drained plot of ground at planting time and by keeping it scrupulously clear of weeds all through the summer. It is an added advantage to plant some runners in 6" pots and carry the plants through the hot weather and rains in this way.

When obtaining young plants from the hills ask for established young stolons. They are more expensive but may be relied on to produce a satisfactory crop the first season.

Strawberries can also be raised on the plains from seeds sown in October or November, but as seedlings seldom bear until the following year, it is more economical to start with young runners.

The ground for growing strawberries should be an open exposed situation and, if practicable, quite free of shade and neighbouring trees. Slight shade does little harm but the flavour of the fruit will be better if the patch is fully exposed to the sun. Any fairly good garden soil will answer the purpose but the heaviest crops are produced by rich friable loam enriched with a good dressing of farmyard manure when prepared for planting. After the ground has been well turned over and thoroughly prepared, it should be laid out in beds of convenient size for irrigation. The young runners should be planted in rows 15 inches apart and 12 inches from plant to plant.

Where soils are stiff and clayey, planting on raised ridges instead of in level beds is to be preferred. When it is considered necessary to adopt the ridge system of cultivation, the base of each ridge should be 15

inches wide and the plants inserted along the sunny side of the ridge 15 inches apart. Water should be freely given during dry weather from the time of planting until the following monsoon season. Weeding should be carefully attended to and the soil between the plants cultivated as often as possible.

When the plants begin to blossom, dry grass or straw should be spread thinly on the ground around the plants in order to preserve the fruit from contact with the soil. In districts much infested with white-ants, it may not be advisable to use dry grass or straw. In this event, broken pieces of earthen pottery may be used for keeping the fruit off the ground.

Should the fruit at times be gritty as is often the case after a shower of rain or after watering, wash the fruit in cold water immediately before use. Washing the fruit in water too much may affect the flavour, but little harm will be done if washing is deferred until the fruit is to be eaten.

At hill stations, a strawberry bed will last in bearing condition for four years, but the fruit will be larger and of superior flavour if the bed is replanted every third year. On the hills, planting may be done in autumn or immediately after the rains are over and at any time during the spring months, inserting the plants at the same distances apart as recommended for the plains. Autumn plantings give a small crop in the second year. Spring planting, if done early, sometimes yields stray fruits, but a crop is not produced until the following year.

Cape Gooseberry (Tipari).—This is a soft-wooded perennial but is cultivated as an annual, and is grown for its gooseberry-like fruits. The latter form good material for tarts and are also in demand for making jams and jellies. Properly speaking, it would be more correct if described under the head of fruits, but it has been included here as it is always associated with the vegetable garden.

It will thrive in all soils, but it bears most pro-

fusely when grown in a rich friable loam, and in areas not liable to become water-logged in the rains. The seeds are usually sown broadcast in beds from the middle of March to the end of June, but the middle of May is about the best time to sow. The young plants when 3 or 4 inches high, are planted in the ground 3 feet apart in parallel rows $3\frac{1}{2}$ feet apart from centre to centre. Water is freely given until the rains commence, and the soil frequently cultivated during the course of growth. When the plants are about a foot high, they should be earthed up to half their height, and when the rains cease, they should be irrigated regularly. In Northern India, the fruit generally begins to ripen about the middle of February, but ripe fruit is usually not plentiful until about the middle of March.

At hill stations, sowing should be made a little earlier than in the plains, or as soon after the beginning of April as possible, and continued until May.

Rozelle—Red Sorrel (Patwa).—This is a tall growing annual of somewhat shrubby habit which is cultivated for the sake of its fleshy calyx or flower receptacle which, when fully formed, is sometimes used in tarts, but more often for making a jelly which resembles red currant jelly imported from Europe in taste and flavour. There are two varieties: one with reddish stems and a deep red calyx and the other with green stems and a calyx of the same colour. The red variety is considered the better, and being the hardier of the two, it is the one most frequently met with.

The seeds are usually sown in beds from the beginning of April to the end of May, and the plants when 4 or 5 inches high, planted out in rich but not recently manured ground at 3 feet apart each way.

After-attention is simply confined to weeding when needed, and watering every seventh or eighth day during dry weather. As the plants are often damaged by frost in Northern India before the fleshy

flower receptacles are fully formed, a warm well-sheltered spot should always be selected for their cultivation.

The plant does not grow in the hills.

Rhubarb.—This is a perennial, with a fleshy, much-forked root, supposed to be a garden hybrid, and to have originated from some of the numerous species of *Rheums* that exist on the higher ranges of the Himalaya. It is cultivated for the stalks of the leaves, which are used for tarts and jellies.

Rhubarb is not adapted for cultivation in the plains. It may, however, be grown with success at hill stations, and especially in gardens situated with a north aspect.

The seeds should be sown thinly during the spring in pans or boxes filled with rich soil, and the plants, when they have made two or three secondary leaves, planted out in the ground in a partially shaded situation at 3 feet apart each way.

The soil should be deep, rich and moist, but at the same time the drainage must be good or the roots will rot during the rainy season months.

After cultivation is confined to occasionally stirring the soil between the plants and keeping it free of weeds. Annually, in autumn, a liberal application of farmyard or compost manure should be worked into the soil surrounding the roots.

It usually takes two years from the date of sowing before the crowns are sufficiently strong to bear cropping. When the soil and situation suit the plant and if manuring is attended to annually, the crowns will continue to bear for many months.

Mushroom.—This is the most esteemed of edible Fungi and is adapted to production under artificial conditions. In cool climates, little difficulty is experienced in raising mushrooms all the year round in close sheds or in underground cellars in a tempera-

ture maintained at an even genial figure, but in Northern India, with its wide range of temperature, the same even conditions are not so easily reproduced.

Very little is, however, known in India regarding the cultivation of mushrooms either by professional or amateur gardeners and the following notes are based more on theory than actual practice for the benefit of those who may care to experiment.

In cultivating mushrooms, the first thing to determine is a suitable place in which to grow them. Instances are recorded of successful results having been attained in the open air in India, but on the whole it is safest to carry on cultivation under cover. A close shed or out-house, or a vacant room in a disused building, with only sufficient openings to admit of a little air and subdued light should be found suitable.

The next matter for consideration is the preparation of the bed. The most essential materials in its composition are horse-droppings, free from grass, straw and similar foreign matter; preference being given to those collected from well-nourished animals. The droppings should be collected daily and kept under cover of a shed or out-house, spread thinly over the floor to prevent premature fermentation. When sufficient has been collected to form a bed, 3 feet broad, 3 feet deep, and any length from 6 feet upwards, formation may be commenced.

To secure perfect drainage, the foundation of the bed should consist of a layer of broken bricks or clinkers 3 inches deep, a layer of droppings 10 inches deep, tramped firmly down, should then follow, next a layer of earth 2 inches deep, composed of two parts good friable garden soil, one part decomposed cowdung and one part decomposed sheep or goat dung; then a second layer of droppings of the same depth as the first, tramped firmly down as before and covered with a mixture of soil as before, and finally a third 10 inch layer of droppings, also tramped firmly down, and

its covering of earth, but the latter need only be an inch deep and should not be added until after the first most violent fermentation action has passed.

Another and simpler plan of forming beds is to mix the horse-droppings with decomposed cowdung, good garden soil and sheep or goat dung. The last three ingredients should be in equal proportions and when mixed together, should be equal to one-fifth of the quantity of droppings. The whole should then be well mixed, and laid over the foundation of broken bricks or clinkers to a depth of from $2\frac{1}{2}$ to 3 feet, pressed firmly down, and finished off with an inch of good soil as a covering, after active fermentation has ceased.

Should the droppings have become too dry before sufficient has been collected before being formed into a bed, they may be moistened with water to the same degree as when freshly deposited.

After a bed has been formed it should be allowed to ferment for 12 or 15 days, and when the temperature has cooled down to 90° or 85° Fahr., it is then ready to receive spawn and the final covering of earth. The temperature may be taken by making a hole perpendicularly in the centre of the bed large enough to admit a thermometer.

There are two kinds of spawn imported into this country, English and French. The former is contained in hard soil bricks, formed of dried cow and horse dung, while the latter is contained in half decomposed loose stable litter. If English spawn is used, it should be broken into pieces two inches square, and inserted in the fermenting material of the bed an inch deep, and 6 inches apart; when French spawn is used, it should be broken into pieces an inch thick, 3 or 4 inches square, and also inserted an inch deep in the bed, but at 15 inches apart. After insertion of the spawn, the bed should be finished off with its final coating of earth and the latter kept dryish for a

time. If the spawn is good, it will show activity in 8 or 10 days, and in the course of the next 15 or 20 days it should have taken possession of the whole bed. It is, however, advisable to examine the bed every few days, and replace such spawn as might not thrive, which can be noticed by the absence of white filaments in the surrounding material.

If culture is carried on in a close room, nothing further requires to be done but to wait for the appearance of the crop, which may occur at any time from six weeks to two and a half months from date of spawning; if, however, the bed is placed in the open, or in a structure not free from draughts of cold air, it must be covered with straw loosely thrown over to keep a uniform temperature. After the mushrooms begin to appear or even before they begin to appear, should the soil on the surface of the bed have become very dry, water should be given from a watering can with a fine rose two or three times a week. Always use lukewarm water.

When beds first begin bearing, the crop is generally prolific, but in course of time, the quantity produced will naturally fall off. When this is seen to be the case, the bed can be stimulated into renewed vigour by applying liquid manure twice a week made up as follows:—

Collect fresh cowdung 10 seers, goat or sheep dung 3 seers, horse-droppings $\frac{1}{2}$ a seer, saltpetre 4 ounces and water 10 gallons; stir these together, allow the solids to settle and water the bed with the clear liquid.

In order to maintain a succession of mushrooms, it is advisable to have several beds made at intervals of about 6 weeks. New beds can be spawned by taking material in handfuls from those already spawned, and inserting it in the manner described for planting prepared spawn.

ANNE

Winter Season

Group and Name.	Seed Order.		Seed		
	Quantity required.	(a) Length of drill sown in situ OR (b) No. of plants produced in seed bed or box.	Date of sowing.		Interval of sowing.
			Hill.	Plains.	
1	2	3	4	5	6
ROOT CROPS. 1. Beetroot (Chakunder.)	1 Oz.	(a) 50'	1st Mar. to 31st May.	15th Aug. to 31st Oct.	Fortnightly.
2. Carrot (Gajir)	$\frac{3}{4}$ Oz.	(a) 50'	1st Mar. to 31st May.	1st Sept. to 30th Nov.	Fortnightly.
3. Parsnip (Juzur)	$\frac{3}{4}$ Oz.	(a) 50'	15th Mar. to 31st May.	15th Oct. to 15th Nov.	Monthly.
4. Radish (Mull)	$\frac{1}{4}$ Oz.	(a) 50'	1st Mar. to 31st Aug.	15th Aug. to 31st Jan.	10 days.
5. Turnip (Shalgam)	$\frac{1}{4}$ Oz.	(a) 50'	1st Mar. to 15th June.	1st Sept. to 31st Oct.	Fortnightly.
BULB AND STEM CROPS. 6. *Celery (Shalari)	$\frac{1}{4}$ Oz.	(b) 125 No.	1st Mar. to 30th Apr.	15th Aug. to 31st Oct.	Monthly.
7. *Leek (Vilayti Piaz)	$\frac{1}{4}$ Oz.	(b) 125 No.	1st Mar. to 31st May.	15th Sept. to 31st Oct.	Monthly.
8. Onion (Spring Piaz)	$\frac{1}{4}$ Oz.	(b) 125 No.	1st Mar. to 31st May.	15th Oct. to 15th Nov.	Fortnightly.
GREEN CROPS. 9. Lettuce (Salad)	$\frac{1}{4}$ Oz.	(b) 125 No.	1st Mar. to 15th June.	15th Aug. to 30th Nov.	Fortnightly.
10. Cauliflower (Phul Gobi).	$\frac{1}{4}$ Oz.	(b) 250 No.	1st Mar. to 30th Apr.	1st Sept. to 31st Oct.	Fortnightly.

XURE A

Vegetables

Sowing		Planting.		
Depth	General Directions.	Space between drills or trenches.	Space between plants.	Period of producing.
7	8	9	10	11
14"	Sow in situ and thin out. Soak seeds in water for 2 days previous to sowing. Then drain off water and spread out seed on damp cloth for a day to become surface dried.	12"	6"	3 to 4 months.
1"	Sow in situ and thin out. Acclimatized seed may be sown from 15th Aug. on the plains.	12"	4"	3 to 4 months.
1"	Sow in situ and thin out. Sow 3 or 4 seeds every 6" and thin out as necessary. Fresh seed is very necessary. An intercrop of early carrots may be sown between rows of parsnips at the same time.	15"	8"	4 months.
1"	Sow in situ and thin out. Radishes can also be interplanted among green Crops.	6"	2"	6 to 8 weeks.
1"	Sow in situ and thin out. Acclimatized seed may be sown from 15th Aug. on the Plains.	12"	6"	3 months.
1"	Sow in seed boxes. Transplant to nursery beds and plant out when 4" to 5" high.	Trenches 24" wide and 4" apart centre to centre.	9" (in two rows 12" apart.)	4 months.
1"	Sow in seed boxes; transplant to nursery beds and plant out when 4" high.	15"	8"	3 to 4 months.
1"	Sow in seed beds and plant out when ready. The ground should be firmly trampled and levelled before sowing seeds or seedlings.	6"	2"	3 months.
1"	Sow in seed beds and transplant when necessary. Early sowings before 1st Oct. should be "cut" early as plants are inclined to flower before fully developing.	12"	8"	3 to 4 months.
1"	Sow in seed beds and transplant when necessary. Acclimatized seed may be sown in July and Aug. on the Plains.	Early 18" Main or Late 30"	15" 18"	Early 3 months. Late 4 to 5 months

ANNE

Winter Season

Seed Order			Seed		
Group and Name	Quantity required.	(a) Length of drill sown in situ OR (b) No. of plants produced in seed bed or box.	Date of sowing		Interval of sowing.
			Hills.	Plains.	
1	2	3	4	5	6
11. Brussels Sprouts	½ Oz.	(b) 250 No.	1st Mar. to 15th May.	1st Sept. to 31st Oct.	Fortnightly.
12. Cabbage (Gobi)	½ Oz.	(b) 250 No.	1st Mar. to 31st July.	15th Aug. to 31st Oct.	Fortnightly.
13. Broccoli (Phul Gobi)	½ Oz.	(b) 250 No.	1st Mar. to 30th April.	1st Sept. to 31st Oct.	Fortnightly.
POD BEARING CROPS.					
14. Peas .. Dwarf. (Matari) .. Tall.	1 lb. 1 lb.	(a) 50' (a) 75'	1st Mar. to 31st May.	1st Oct. to 15th Nov.	Two to three (a) weeks.
15. Beans-French or Kidney (Vilayati Sem.)	½ lb.	(a) 50'	1st Apr. to 15th June.	15th Aug. to 15th Oct.	Two to three weeks.
16. Beans (Broad) (Bakla).	1 lb.	(a) 50'	1st Mar. to 31st May.	15th Oct. to 30th Nov.	Two to three weeks.
17. Beans-Runner (Sem.)	½ lb.	(a) 50'	1st Apr. to 30th June.	15th Aug. to 15th Oct.	Three weeks
MISCELLANEOUS CROPS.					
18. *Potatoes (Ahi)	10 lbs.	(a) 50'	20th Feb. to 15th Apr.	15th Sept. to 15th Dec.	One month.
19. *Tomatoes (Vilayati Bangan.)	½ Oz.	(b) 250 No.	15th Mar. to 31st May.	15th July to 30th Oct.	One month.
20. Jerusalem Artichokes.	10 lbs.	(a) 50'	15th Feb. to 15th Apr.	1st Mar. to 31st May.	One month.

* The special cultural notes regarding Celery, Leek, Tomatoes and Potatoes should

XURE A—*concl.* Vegetables

Sowing.		Planting.		
Depth	General Directions.	Space between drills or trenches.	Space between plants.	Period of producing.
7	8	9	10	11
$\frac{3}{4}$ "	Sow in seed beds and transplant when necessary.	30"	24"	3 to 4 months.
$\frac{3}{4}$ "	" " " "	} Early 18" Main or Late 24"	15"	Early 3 months. Late 4 to 5 months.
			18"	
$\frac{3}{4}$ "	" " " "	30"	24"	3 to 4 months
2"-3"	The detailed instructions regarding the planting of sweet peas are generally applicable to peas. Sow in situ on drills and thin out from 4" to 8" apart. Firmly tread down soil before sowing seed. A few plants may be grown in 3" pots also to replace casualties. Early carrots, radishes and turnips may be sown between successive sowing of peas.	} Dwarf 24" Tall 48"	4" 6"	3 to 4 months.
2-3"	Sow in situ 4" apart and remove or transplant surplus plants.		18"	9"
3 $\frac{1}{2}$ "	Sow in situ. Treat as for peas. When the plants are in full flower or 8' high the point of each shoot should be nipped off so as to encourage the pods to set.	30"	8" in two rows (5" apart).	4 months.
2"	Sow in situ and treat as for peas.	30"	8" in two rows 5" apart.	4 months.
5"	Sow in situ. For planting make holes 4" to 5" deep and place the tubers in these holes on their sides with the buds pointing along the drill and in the same direction preferably Northwards. Medium sized seed tubers are most satisfactory.	} Early 24" Main crop 30"	0" 15"	4 to 5 months.
$\frac{1}{4}$ "	Sow in seed beds or pans and transplant when 8" to 4" high.		30"	
5"	Follow generally the directions for the planting and cultivation of potatoes.	30"	15"	7 to 8 months.

be studied.

ANNEXURE B. Hot Weather Vegetables.

Common or Garden Name.	Date of Sowing.		Interval of sowing.	Depth of sowing.	Space between drill or trenches.	Space between plants.	General Directions.	Date Producing.
	Plains.	Hills.						
1	2	3	4	5	6	7	8	9
1. Egg (Alaesa Sag. Lal Sag).	1st April to 31st July.	1st April to 31st July.	Monthly.	3" to 4"	15'	12'	Sow in situ and thin out ..	June onwards
2. Sword Bean (Bera Sen).	15th April to 30th June.	Not grown above 4000'	Monthly.	3'	5'	12'	Sow in situ. The plants will need strong supports.	October-November.
3. *Capsicum Chilli (Mirich).	1st April to 15th June.	1st April to 15th June.	Monthly.	4"	18"	12'	Sow in seed beds and transplant.	June onwards.
4. Water-Melon (Tur-buz, Karbu).	15th Jan. to 31st March.	Not grown above 3000'	Monthly.	2"	5'	5'	Sow in situ 3 or 4 seeds on each patch and remove all but the strongest plant.	June onwards.
5. Melon (Karbura) ..	15th Jan. to 15th March.	Not grown.	Monthly.	2"	3" to 1'	3' to 1'	Sow in situ. As above ..	June onwards
6. Kairi ..	15th Feb. to 30th April.	Not grown.	Fortnightly.	2"	3'	3'	Sow in situ. As above ..	June onwards
7. Cucumber (Khira).	1st March to 31st July.	1st March to 15th July.	Monthly.	1"	5'	6'	Sow in situ. The plants should be staked like Peas.	" "
8. Charkin (Gel Khna.)	1st March to 31st July.	Not grown.	Fortnightly.	1'	15'	3' to 4" in two rows.	Sow in situ on ridges ..	" "
9. Pumpkin (Kadai).	1st Feb. to 15th July.	15th March to 20th June.	Monthly.	2"	5'	5'	Sow in seed beds and transplant. Needs strong support to prevent fruit from rotting. Train on outposts or compound wall.	" "

*The very large mild podded kinds usually raised from imported seeds may be sown in the plains during October and treated as a cold weather crop.

ANNEXURE—B.—*concid.* Hot Weather Vegetables.

OTHER ESSENTIALS

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Common or Garden Name.	Date of Sowing.		Interval of sowing.	Depth of sowing.	Space between drill or trenches.	Space between plants.	General Directions.	Date Producing.
	Plains.	Hills.						
1	2	3	4	5	6	7	8	9
10. Squash, Vegetable Marrow, (Vilayati Kaddu.)	15th Feb. to 15th April.	15th Mar. to 15th June.	Monthly.	2"	5"		As against 8	June onwards
11. Country French Bean (Sem.)	1st May to 30th June.	1st May to 30th June.	Monthly.	2"	5"	6"	Sow in situ. Should be stacked like Peas.	Sept. to Dec.
12. Sweet Potato (Mitha-Alu.)	20th April to 30th June.	Not grown above 4000'.	Monthly.	4"	18"	18"	Propagate from tuber or cuttings.	" "
13. Ladies Fingers. (Bhindi.)	1st Mar. to 31st July.	15th Apr. to 15th June.	Three Weeks	1 1/2"	24"	24"	Sow in seed beds and transplant.	July onwards
14. Bottle* Gourd (Lauki.)	1st Mar. to 15th July.	1st Apr. to 31st May.	Monthly.	2"	5"	5"	Sow in seed beds and transplant. Similar treatment to Pumpkin.	" "
15. Egg Plant. (Brinjal.)	Oct. 15th Feb. to 31st March, July. (3 sowings.)	Not grown.	Monthly.	1 1/2"	18"	15"	Sow in seed beds and transplant when ready. Oct. sowings should be planted out in the next spring.	Mar. to Sept
16. Asparagus Bean (Lobia.)	1st June to 31st July.	Not grown.	Monthly.	2"	4"	6"	Sow in situ. Should be stacked like Peas.	July onwards
17. Maise. (Maka)	15th April to 15th June.	1st May to 30th June.	Fortnightly.	2"	2"	18"	Sow in situ 6" apart and thin out to 18". When the plants are 15" high they should be earthen up to 4" or 5" and the operation repeated when the plants are 2 1/2" high.	Aug. onwards.

CHAPTER IX—MAINTENANCE AND CULTIVATION

(I) IRRIGATION AND WATERING

THE quantity of water required for a garden is so much a question of character of soil and climate, that without local details it is difficult to advise. One thing alone is certain, and that is that if a *mali* is left to his own devices, more often than not, he will grossly over-water a garden, particularly if water can be applied without any effort on his part. To him, water is a panacea for all ills in the garden!

Judicious irrigation avoids diseasing the soil. Moisture sufficient for plant life can be conserved by frequent cultivation and the formation of a fine tilth in which capillary tubes cannot exist.

In the case of over-irrigation, salts which may be present in the subsoil, or in water in the sub-soil, are drawn by capillary attraction to the surface of the land.

In dry climates it will generally be found that half an inch of water in depth is a fair weekly allowance. This is equivalent as nearly as possible to one gallon of water per square foot of area per month, or 45,000 gallons per acre per month.

In places with an appreciable rainfall the quantity of water required will of course be much less. It will seldom be found that any soil will benefit by retaining more than 25 to 30 ins. of rainfall or irrigation water per year.

The water should be supplied at long intervals (not more frequently than once a week) and in liberal quantities. A liberal supply soaks into the soil and less of it is lost by evaporation, while the roots are encouraged to grow downwards. On the other hand, a small supply at short intervals keeps the roots near the surface where they are subject to frequent changes of moisture and temperature.

If water is available at sufficient pressure and

regularly according to one's need, there is no difficulty in its application, and care will only have to be taken to prevent over-watering.

If, however, one has to depend on an inadequate or intermittent supply of water, the best course is to collect the water in tanks and to distribute it, if possible, by gravitation, or, if this is not possible, by motor power. One advantage of supplying water through tanks is that the quantity can be reasonably measured. 1 cubic foot equals as nearly as possible six gallons of water.

It is a criminal waste of money to depend on hand watering. Not only is this extravagant, owing to considerable wastage by evaporation, but the wages of *mali*s is an unnecessary burden.

It has been found by experience that while a garden of an acre in extent watered by flow required only one *mali* to maintain it, a garden of similar size watered by hand required about 4 *mali*s. The reason for this is that a *mali* can conveniently distribute only about 100 gallons of water per hour by watering-cans, or 800 gallons per day. As quite half this water is wasted by evaporation he can only water about $\frac{1}{4}$ of an acre a month.

Splendid little portable pumping units are now available on the market which can be worked either by electricity or oil engine motors. Small units are capable of distributing 500 gallons per hour at a negligible running cost. These pumping units pay for themselves within a few months of their purchase and are useful for a variety of purposes, such as watering roads, cleaning cars, washing out poultry houses, etc.

The electric motors are of low tension and can be used like other domestic electric fittings such as table fans, table lamps, etc. They need only to be fitted on portable hand-driven trolleys and to be provided with a sufficiently long rubber-sheathed trailing cable. *Minus* recording meters should be

used to obtain the benefit of power rates for current consumed.

The oil engines are similar to small motor-cycle engines and are more troublesome to look after than electric motors, but are, nevertheless, a great boon and advantage when electric current is not easily obtainable.

Water is pumped from the tanks and distributed to the garden through hose pipes or through especially made sheet iron pipes of about 8 feet to 10 feet in length, which can be telescoped together to give the required lead.

(2) CULTIVATION AND TILLAGE

It is advisable to read the chapter on Irrigation and Watering concurrently with this chapter.

There is no branch of gardening that is more neglected in India than cultivation of the soil.

Even as irrigation is overdone, so is cultivation neglected, and yet there is a close link between the two. It is a fact seldom appreciated that a well-cultivated or well-tilled garden needs much less irrigation and much less manure than one in which this operation is neglected.

Thorough tillage, or stirring and inverting the soil, has a very important effect on cultivation, and much of the effect of manuring may be produced by stirring the soil thoroughly and leaving it, in a rough state, exposed to the sun during several months of the hot weather. The effect produced by the sun heat acting on the opened-up soil is practically the same as the beneficial effect of frost in temperate climates—soil particles are torn apart and air gets free passage. Especially is this important in irrigated gardens with heavy soil. Repeated irrigation during several years has a very injurious effect for which liberal manuring will not compensate. Digging in the tropics is hard work and there is a constant tendency to rely on manure and water for fertility which could be attained by utilizing the plant food already in the soil. If the

digging be carried out during early morning hours, the heat due to direct exposure to the sun may be avoided. Leaving the upturned soil exposed to the air and sunshine has a powerful effect in disintegrating heavy soils. Hurried preparation of the soil immediately before it is required is a waste of the powerful agencies, air and bacteria.

The theory of the effects of tillage, as given by Warrington in *The Chemistry of the Farm*, is concise and explicit :—

“ By tillage the surface soil is kept in an open porous condition, favourable for the distribution of roots. By this means also, capillary attraction is diminished and the land consequently suffers less from drought ; the water-holding power of the surface-soil is also increased. A more important result of tillage is that the soil is thoroughly exposed to the influence of the air. Soils containing humus or clay will absorb ammonia from the atmosphere and thus increase the store of nitrogen. The organic remains of former crops and manuring are also oxidised, the nitrogen being converted into nitric acid. The rocky fragments which a soil contains, such as fragments of silicates or limestone, will at the same time be more or less disintegrated by the combined action of water and air ; assisted by the carbonic and humic acids arising from the oxidation of vegetable matter and a portion of the insoluble plant-food be thus brought into a state suited for absorption by the roots of crops.”

It is a fact that is seldom appreciated that in compact soils water rises and escapes by evaporation while in well cultivated soils the effect is the opposite. The loss from evaporation in compact soils has been found by test to be retarded about 90% from a water level about 2 ft. beneath the surface by the simple process of stirring the surface weekly two inches in depth.

Moreover, the air is frequently charged with moisture and entering a loose soil finds at little depth a cool layer which causes a deposit of further moisture from the atmosphere.

Again, salts which might be present in subsoil or in water in the subsoil are drawn by capillary attraction to the surface of the land in cases in which the land is over-irrigated or not adequately cultivated. Frequent cultivation forms a fine tilth in which capillary tubes cannot exist. Thus cultivation and tillage is also beneficial in salt-ridden soil and it is clearly imperative to provide a good tilth by cultivation and not to allow the surface to dry out and cake.

The following experiment will test the truth of what is claimed above.

If two clean sheets of glass be placed at one side in contact and at the opposite side be kept apart by the thickness of a sheet of paper, and, being held together by bandages, are placed vertically in coloured water a quarter-inch in depth, the water will be seen to rise between the sheets forming an elegant curve, highest at the point of apparently actual contact and lowest at the side of greatest aperture, *i.e.*, where the paper is inserted.

In the earlier chapters dealing with several sections of gardening the necessity for regular cultivation has been stressed and it will be found a good plan to devote at least one day a week to this item of gardening. In this way alone will it be found possible to watch that the *mali* does this very necessary work. He sees no apparent benefit from the process and so leaves it alone, preferring to use more water, with less trouble to himself. As previously stated, not only will tillage appreciably reduce the quantity of water required but it will improve the growth of the plants a hundredfold. Incidentally regular cultivation ensures greater freedom from weeds.

(3) LIMING THE SOIL

"Lime and lime without manure
Make both land and farmer poor!"

This is a very old saw which sets forth clearly that lime is not a fertiliser.

Though lime has no fertilising properties it is a necessary constituent of all fertile soils and its value in horticultural pursuits can scarcely be over-stated.

The action of lime upon soils is two-fold, chemical and mechanical. Applied as fresh or quick lime to soils containing a large amount of organic matter, such as peaty soils, or land that contains an accumulation of humus, lime combines with the organic matter and rapidly disorganises it, setting free much plant food that previously was not available to the crops. It is this chemical result that renders long-manured gardens so fertile after liming and it also supplies the reason why new and rank soils are made sweet and fertile when caustic lime is applied. Lime is a soil scavenger, burning up decomposing organisms, and in the process setting free food which the roots of plants are quick to take advantage of. In some cases lime eliminates danger from fungus diseases.

Leguminous plants benefit greatly from large^e dressings of lime to the soil while grasses and potatoes^s also appreciate it, but it must not be forgotten that unless organic matter is supplied at intervals, crops will wear out or cease to be productive on much-limed soils. In short, lime is highly beneficial on heavy and freely manured land but it is of little value on poor or light land. Indeed in such cases it is the worst dressing that could be given.

Independently of its action, chemical or mechanical, in soils, lime, when newly slaked, is valuable to the gardener as a slugicide and crop protector.

The best soil will deteriorate if not limed at least once in three years. The best time to carry out the operation will be found to be just after the monsoon and preceding the winter sowings and plantings.

One can always ascertain accurately how the land stands in the way of its lime contents by carrying out the following simple test.

Take a few samples—a handful here and a handful there—from both top soil and subsoil all over the plot and mix them well together. That gives an *even, general sample*.

Then take a pound or a little less of this soil mixture, place it in a 2-lb. glass jam-jar, add water (enough to make a thin paste) and break up all the lumps with a stirrer (a piece of wood).

Now add two or three tablespoonfuls of strong hydrochloric acid and stir up again.

If the mixture bubbles up and froths over, there is *lime there and to spare*.

If the fizzing that is going on can be heard when the jar is held as far away from the face as a printed book would be held, there is *enough* lime there.

If the fizzing can only be heard when the mouth of the jar is placed to the ear, the land, although it contains *some* lime, wants more.

If no fizzing can be heard at all, it is *an urgent case for Dr. Lime*, and the sooner lime is given the better.

In the case of a newly established garden it is advisable to carry out this test annually.

In order to get the best results the right kind of lime must be used.

White lime as used for building purposes is generally suitable. Buy the lime unslaked or in lump form. The lime will have to be slaked before bringing it into use. For this purpose it should be placed in a heap and well sprinkled with water. After an hour or so the heap should be turned with a shovel and then sprinkled and turned again until the whole is reduced to a powder. Any lumps that will not slake should be smashed up before use.

An alternative method of slaking lime when dealing with small quantities is to dig a hole in the ground and bury the quick or unslaked lime. In a day or two the lime will swell considerably and give out violent heat. When swelling ceases remove the soil

cover and the lime will be found to have fallen down to a powder as fine as salt. The lime freshly slaked is now ready for use.

It will be found that an application of about $\frac{1}{4}$ to $\frac{1}{2}$ lb. a square yard of ground under cultivation is a generous allowance for all general purposes. About half this quantity is sufficient for lawns.

The lime should be spread evenly on the surface, a dry, calm day being chosen for the purpose.

After spreading, fork it in just beneath the surface as lime sinks rapidly into the soil. If, as in the case of lawns, it is not possible to fork it in, the lime may be worked in with an application or two of water.

On no account allow lime to come into actual contact with stable manure or ammonia sulphate or nitrate of soda. The substances are opposites—the manures contain acids, while lime is an alkali. The mixture of the two merely results in the loss of nitrogen as ammonia gas.

When digging in green manure it always helps to sprinkle freshly slaked lime on the green stuff as the digging proceeds ; see also page 159.

Quick lime may also be used with advantage in compost heaps as it helps to speedily rot down green stuff ; see also page 154.

(4) PLANT PROPAGATION

(a) SEEDS AND SEEDLINGS

There is no unbelief ;
Whoever plants a seed beneath the seed,
'And waits to see it push away the clod,
He trusts in God.

Lizzie York Case.

Very many amateur gardeners are in the habit of buying seedlings, as they rather fear their ability to raise successfully their own and have the mistaken impression that much trouble and "messaging about" is involved. After reading the following helpful hints and suggestions it is felt that many who had not at-

ready made a practice of doing so will raise their own seedlings from their own sowings, and that they will soon realise the advantages. The cost saved by doing this is very considerable. It is not possible to buy many seedlings for the price of a few packets of seeds from which many hundreds of seedlings may be raised. Another point to bear in mind is that when one raises one's own seedlings and handles them properly they receive practically no check at all in their growth. One can choose the most suitable time to put them out and can handle the young plants just when they are ready. Another very great advantage is that many commercial raisers of seedlings, owing to keen competition, are forced to buy comparatively cheap lines of seed and one has no assurance that one's garden will be stocked with the best bred strains that it is possible to obtain.

There are three methods of raising seedlings :—

- (1) *In seed pans, pots or boxes.*—This is the most troublesome method. Only the most valuable seeds or those of which very few plants are required should be sown in pans or boxes.
- (2) *In specially prepared seed beds.*—Acclimatised seeds and vegetable seeds, plants of which are required in fairly large quantities, should be sown in seed beds, provision of which has been suggested in the "work garden".
- (3) *In position or at site where the plants will be grown.*—Broadcast sowing in this way is attended with risk of failure due to heavy rainfall or destruction by ants and other pests. The method should therefore not be adopted except in cases in which seedlings cannot be transplanted or where large reserves of seed are available.

Detailed instructions for sowing seed in pans and seed beds are given below.

It has been established by practical experience that the best time for sowing seeds is two days before the full moon. This is particularly worth bearing in mind when dealing with expensive seeds and those that give trouble in germination. Therefore, try to sow seed as near as possible to the full moon.

Germination will be better, and better and more vegetables will be obtained from a full-moon crop. Seeds sown just before new moon give the worst results.

Seed Sowing in Pans or Boxes.

The simple requirements are: (1) Some shallow boxes or earthenware pans 4 to 6 inches deep, with holes or slits in the bottom; (2) a $\frac{1}{4}$ in. garden sieve; (3) some light, sandy loam; (4) some moisture-holding ingredient, such as well-rotted compost manure or leaf mould.

Sieve the loam and then the manure or leaf mould as required, thus removing all lumps, sticks, stones, etc. Mix the loam and the moisture-holding ingredient in equal parts and, if necessary, add sand until the mixture is light enough not to cake when damp if pressed together in a handful. A large heap of this prepared mixture may be made and left in the open for use as required. Before using, it should be thoroughly damp but not so wet that it will not run easily without clogging when handled.

Next prepare the box or pan by putting at the bottom a layer of clinker ash, coarse gravel or other material to provide drainage and fill it with the prepared mixture. Then shake and lightly "dump" the box or pan to thoroughly settle it and gently press down the corners so that the surface is level; top up with some more prepared mixture if necessary, and level off with the edge of a short, straight batten. The depth of the prepared mixture should not exceed about 3 inches, otherwise it may become sour through lack of aeration.

Now the seed may be sown. Broadcast sowing in seed boxes, though permissible and often practised,

is not recommended. Using the edge of the batten, make parallel shallow depressions across the surface 1" to 1½" apart, very shallow for fine seeds and deeper for larger seeds (the depth should not be more than twice the thickness of the seeds). Next open one end flap of the packet and if the seed is fine and runs freely, crease a channel and by tapping the side with the forefinger as you move the packet along the row, it is quite simple to sow evenly and thinly. If seed is very fine and for those presenting difficulty in sowing thinly enough, add to the seed in the packet about twice the quantity of dry, fine sand and thoroughly mix before sowing as described above.

The next operation is the covering, and it is important that it be done carefully. In the case of exceptionally fine seed, sprinkle a very thin dusting of dry sand and with a flat block or flat side of the batten, firmly press down the whole surface of the box. With larger and coarser seeds a covering of finely sifted soil or leaf mould should be sprinkled on through the sieve, and then pressed down as above. Generally the covering soil should be above twice the diameter of the seed sown.

It is essential that the whole contents of the box be now thoroughly damped without disturbing the surface (and thus washing seed away). A very fine hose on a watering-can or a very fine moist spray on a hose are best; the spray should be allowed to fall on to the surface of the soil and not direct at it; failing this, newspaper or a wet sack or a thick cloth may be laid on the surface and water applied through it; or yet another way is to stand the box or pan in shallow water, reaching a level not higher than 2 inches below the surface of the soil. When moisture shows on the surface of the soil, remove the box or pan from the water.

The next consideration is protection of soil surface. If the seed is fine and therefore sown very shallow, cover the box with a sheet of clear glass and place on top of the glass a sheet of newspaper; if glass is not avail-

able, a sack or hessian may be laid over the box or pan. The larger seeds will not need the covering, unless at a very hot time of the year because they are sown a little more deeply and are unlikely to become dry. Place the box or pan on a bed of ashes in a position where wind and hot westerly sun do not reach them. An hour or two of morning sun is all that is required at this stage. The ashes provide good drainage without allowing excessive evaporation from underneath and at the same time are repugnant to slugs and snails which sometimes are a nuisance.

Lime (sometimes mixed with tobacco dust) sprinkled freely round the boxes (not on them) is the best method of combating these pests.

With early sowings of cold weather plants, the water-can is an implement of destruction in the hands of a careless *mali* and his work needs to be very carefully watched, as damage through over-watering of seedlings cannot be remedied. His one excuse on such occasions is bad seed and the owner is, unfortunately, in most cases only too ready to accept this explanation and blame the seed supplier even though he may have dealt with a firm of repute, the germinating powers of whose seeds have been carefully and scientifically tested before being placed on the market.

In the great majority of cases, failure to germinate is caused by an excess of moisture, it being the *mali's* habit to sprinkle the beds at regular intervals, irrespective of the fact that moisture may already be in excess of requirements.

When the first signs of growth appear, remove the paper or other covering and if using glass raise slightly at one end to admit air. Gradually the glass can be removed and the tiny plants will become hardened to the atmosphere and will quickly grow to a height of $\frac{1}{2}$ to 1 inch, which will usually be when they are just showing their second and third leaf (this is a good guide as to when to carry out instructions in next paragraph).

They will now be ready to transplant to other boxes or pans and this process is known as "pricking out." It is not absolutely essential where the seeds have been sown very thinly but this practice is followed by all expert seedling raisers for reasons which the following notes will clearly show. Prepare another box just as described earlier in these notes. Make lines or depressions with a batten as before, about 2 inches apart, and cross lines at right angles in the same manner. Make a pointed round stick or dibber about the size of a thick crayon pencil. It is intended to prick out a plant in each place where the lines cross, so as to finish up with a square pattern which is referred to later. Before attempting to transplant or prick out small seedlings it is essential to moisten thoroughly the soil in which they have been raised so that when lifted the soil particles will adhere to the roots and not tear them away. Make the first hole in the first row of the new box. Then insert the point of the dibber alongside the seedling to be pricked out or transplanted from the old box. A slight leverage will readily lift the young plant with roots intact and some soil attached. Drop it neatly into the hole prepared in the soil in the new box and with the point of the stick press the soil gently but firmly side ways against the root. It is important to press the soil gently but firmly well round the roots of the newly transplanted seedling. Careful manipulation of the dibber will do this. Some prefer to use thumb and forefinger. Continue this until the new box has a seedling in every place indicated by the crossing of the lines formed by the batten. The seedlings will all be in straight rows and spaced the same distance. This pricking out should preferably be done on dull days and out of hot sun and wind. The depth to which the little seedlings will be "pricked out" in the new box will be indicated by the depth they held in the original box but a shade deeper is desirable.

Next, water the new box carefully, but thoroughly, with an overhead sprinkler as it helps to consolidate

the soil against the roots. Then stand the box on ashes as before. Be sure to afford protection from winds and too much sun which will quickly dry out the seedlings and stunt them. They will now grow more quickly than before and will soon be large enough to plant into the open ground. Choosing dull weather for the work, this transplanting should be done when the plant is strong and sturdy and just commencing to show vigorous leaf and stem growth—in other words, when the first “baby stage” is finished. As the seedlings were “pricked out” on the square system, the box in which they are growing can now be thoroughly moistened and a deep cut with a knife run in the middle between the rows, first one way and then at right angles; each plant will then be standing in a square block of soil which can be lifted easily with a garden trowel, or even with the fingers, and planted into its permanent place in the garden bed. By following this process, the young plant need not suffer any shock of transplanting at all and there need be no losses from this cause and they will continue their growth without a check.

When transplanting to garden beds allow ample space between the plants, a spacing of six inches for dwarf plants and ten inches for tall growing plants will be found adequate.

After transplanting the seedlings should be protected from the sun and hot winds for a few days.
Seed Sowing in Seed Beds.

The preparation of seed beds should be put in hand a month or six weeks before they are required for use. As previously stated in the chapter on the “Work Room”, the beds should be located in an open, airy situation and not in the shade of over-hanging trees or tall buildings. They should run, preferably, from north to south.

Thorough drainage is the first essential. The surface should be about 12 inches above surrounding level sand each bed should be surrounded by a drain-

age channel for carrying off storm water. The foundation should consist of 4 inches of coarse rubble or similar material covered with an inch deep layer of coarse leaf mould or compost. If cinder ash is available it may be added to the foundation with advantage. On this foundation put 2 inches of coarse soil before adding the final 5 inches of finely-worked compost made up of about equal parts of finely-sifted leaf mould or compost manure, loam and coarse sand. A width of 4 to 5 feet for the seed bed is most convenient as this enables the *mali* to give the seedlings the attention required without having to tread about the surface. For protection from the rain and strong sun, shelters of cheap material such as *gunny* (jute) or *sirkhi* (straw) matting should be provided.

For supporting the shelters three parallel wires should be stretched the length of the beds on iron or wooden post supports, the centre wire being about 18 inches higher than the two outer ones. The roofing material should be so fixed that it can be kept adjusted or rolled up according to weather conditions.

The prepared area of the bed should be well watered and then divided off by raised ridges into small sections of 1 to 2 square feet for different varieties of seeds. If only a few seedlings are required it will suffice if the seeds are sown in one or two single lines running across half the width of the bed. It is surprising how many seedlings can be grown in a length of only 12 inches.

The seeds actually should be sown in accordance with the directions given previously for sowing in pans.

In order to prevent confusion through intermixing of labels, a plan of the seed bed should be kept. To avoid the mixing of varieties and colours, no two varieties of the same species should be planted alongside. Thus cabbage and cauliflower should be kept apart as also all varieties of *Antirrhinum* and so on.

For successful raising of seedlings of cold weather plants during the hot, humid days of the rains, ample

sowing space is essential ; harmful dense sowing is to be avoided. It is extremely difficult to make the *mali* understand the many disadvantages of too dense sowing, and if not closely supervised when carrying out this operation, he will repeat this mistake year after year and not profit in the least by observation and experience.

If it is found that the seeds germinate too closely they should be thinned out or "pricked out" into other beds, as circumstances dictate.

A big risk is "damping" which usually occurs during a period of bright hot sun following a dull rainy spell. It is caused by a fungus which attacks the seedlings at ground level, eating into the stems and completely destroying all that become infected. This disease cannot in all cases be prevented, but the chief safeguards to be observed, are well drained seed beds with a light surface soil ; thin, well scattered sowings and the admission of all light and air possible during dull, cloudy days. Should damping occur in any part of the seed beds, fresh seed should not be sown in the same soil as the fungus spores remain and the second batch of seedlings is almost sure to become affected unless weather conditions have, in the meantime, changed, and are unfavourable to the particular kind of fungoid growth. A depth of 3 inches of surface soil should be completely and cleanly removed, and fresh uninfected soil substituted.

Too dense sowing is the chief cause of damping and it is a fault the *mali* will persist in, no matter how often corrected. It is therefore better for the owner personally to sow seed and supervise later operations, which should be carefully completed.

The procedure for transplanting to their permanent place should be carried out carefully in accordance with the directions already given for transplanting from seed pans. If the weather is unduly warm the seedlings should be given shade for a few days after transplanting into open beds by means of *sirkhi*

(straw) matting or by inserting well foliated branches of *necm* or other trees between the seedlings.

A careful inspection should be made to see if there are ant colonies in the neighbourhood of the seed beds. The ant is a garden pest both directly, and indirectly—directly, as a colony, once started, will empty a seed bed of its newly sown seed within a few hours of its sowing; and indirectly, because of their instinctive distribution and shepherding of aphids and other forms of insect life, injurious to plants. Where ant colonies exist close by, they should be destroyed by digging up the nest and thoroughly soaking the soil with a strong solution of phenyle or, if the nature of the site does not permit this, they may be eradicated by the use of Cyanogas powder. The method of using this is described in the chapter on Lawns. To leave them undisturbed is asking for trouble and will almost certainly necessitate the re-sowing of seeds of composites and other large albuminous kinds.

If the nest itself cannot be destroyed, one preventive measure is to place flat vessels containing treacle where the seed are sown as a counter attraction and sticky end for the ants. Another measure is to mix a little ground turmeric (*haldi*) with the seed before sowing.

Sowing Seeds at Site.

These are general instructions and in no way supersede the special instructions given elsewhere regarding the sowing of special seeds such as sweet peas, certain varieties of vegetables, etc. When seeds are sown at site the beds or borders previously will have been prepared in accordance with the general directions given in the chapters on Flowers, vegetables, etc. In addition it will be necessary to afford some special treatment to the ground before sowing the seed. This will consist of adding or replacing one inch or so of the surface soil by finely worked compost made up of about equal parts of finely sifted compost manure and loam.

The seed should then be sown broadcast or in drills as circumstances dictate in accordance with the directions given previously for sowing in seed beds. Subsequent treatment regarding irrigation and protection from sun, wind and ants also will apply.

In cases in which seeds are sown broadcast into their permanent place in the garden, severe thinning out of seedlings will be necessary or overcrowding will soon occur, to the detriment of individual plants and the general appearance of flowering beds and borders. As already recommended, a spacing of 6 inches for dwarf plants and 12 inches for tall growing plants is adequate.

When thinning out annuals, care should be taken to weed out all self-sown seedlings from the previous season's growth. If left to grow they will result in a confused mixture of colours and varieties and may completely destroy the effect of the new planting.

Great care must be taken to avoid water-logging and there should be regular cultivation of the soil at short intervals.

(b) CUTTINGS AND LAYERS.

Cuttings.

It is often quicker to reproduce trees, shrubs and other plants by cuttings than by other methods. A cutting possesses the advantage of producing a plant truer to the parent strain than a seed as with the latter there is always the chance of a throw-back or pollution.

Cuttings are best made from young wood and the latter should as far as possible be taken from shoots grown high up the tree or shrub. Some plants strike quickly from cuttings of very young wood and even thin green shoots, whilst others succeed better from fully matured wood. Experience will show the more profitable method but generally it is safest to use for cuttings somewhat matured wood of a year's growth.

Cuttings can vary from $\frac{1}{4}$ " to $\frac{3}{4}$ " in thickness, according to the age and type of wood selected. Those from trees or shrubs should be 8 or 9 inches in length ; while cuttings from small plants such as the Coleus should not be longer than 5 or 6 inches. Cuttings that are too long are more apt to perish. Slips should be cut at a slant just below a leaf bud or node. All the leaves should be stripped off except a leaf bud near the top of the cutting.

If ordinary cuttings fail, *tear off* a small branch so that a piece or 'heel' of the parent stem and bark is torn away with it. Occasionally such slips succeed better than cuttings.

A portion of the nursery [see chapter VIII (5)] should be set aside in the form of a nursery bed for the propagation of cuttings. Beds prepared in the manner proposed for seed beds *vide* (a) above will serve the purpose admirably.

Newly planted cuttings need a certain amount of artificial protection from sun particularly in hot dry districts. The beds should be well watered until the rains break.

Cuttings from shrubs or trees should be planted at a slight slant with about a third of their length in the soil, each cutting far enough from its neighbour to be lifted easily when it has struck. Short cuttings from small plants are better placed upright with an inch of their length beneath the ground. The soil must be pressed down firmly round each cutting.

Small delicate cuttings are best planted in an earthenware pot, in a circle quite close to the rim. The compost in the centre is watered rather than the actual cuttings, the moisture spreading down towards the sides and the lower ends of the cuttings. A pane of glass can be placed over the top of the pot and the pot itself sunk up to the rim in the earth to prevent evaporation of moisture from its walls.

A soil suitable for such cuttings may be made up of 2 parts clean sand, 1 part sieved leaf mould and 1 part powdered charcoal.

It is best to take cuttings towards the end of the parent plant's dormant period, *i.e.*, just before active growth takes place. In the case of plants that grow best in the cold season, they should be cut at the beginning of the cold weather. For the general run of tropical shrubs and trees, cuttings are best taken at the end of the dry weather just before the early rains are due.

Cuttings may take some weeks before they strike roots, those from quick-growing plants striking more readily than those from woody, slow growers. Sometimes shoots sprout straightaway, but this usually means that the cutting is drawing upon reserves within itself. This premature activity must not be confused with the growth which follows the formation of new roots.

Layers.

Layers are slower than cuttings, but are often successful when the latter fail. By layering, a branch is partly severed from the parent plant and induced to throw roots at the cut. Eventually the layer is separated from the parent.

Layers should be made at the same time as recommended for cuttings.

To layer a plant, select a ripe and pliable branch, bend it downwards and on the underside of the bend at ground level cut it halfway through just below a leaf bud. Slit the branch upwards at the cut towards the tip of the branch for an inch or so, thereby forming a tongue with the leaf bud at its tip, and keep this open by inserting a matchstick or a piece of gravel. The branch is then "pegged" into the soil with the cut buried 2 or 3 inches, according to the size of the branch. A second peg is sometimes necessary on the other side of the tongue. The soil should be well dug before "pegging" down the layer, and thereafter kept moist and shaded.

If the branch is too stiff to be bent to the ground, the layer may be "pegged" into a hollow section of

bamboo, slotted at the top to allow the branch to pass through it, or through a pot filled with sand and prepared compost. If a pot is used, it will be necessary to support it on a raised stand.

When the layer shows signs of rooting, it can be cut from the parent in easy stages by making a notch in the parent stem, which is deepened every day or so until the branch is gradually cut through.

When layering is done in the spring, roots may form in the rains and the plant lifted in the autumn, but layers from very slow-growing trees or shrubs may take much longer.

(5) SEED COLLECTION

It is the nature of all plants, left long enough in the ground, to produce seeds.

There are two schools of thought on whether it is worthwhile collecting seed from one's garden.

One school definitely condemns the idea as very foolish and contends that ninety-nine times out of a hundred home-saved seeds are to all intents and purposes a complete failure!

Another school advocates that an amateur, on grounds of economy alone, should collect as much seed as possible.

Both schools take extreme views which may be disregarded and a medium course followed.

Before deciding on collecting seeds it must be remembered, first, that the process is both tedious and troublesome. Secondly, that there will be failures and disappointments; and finally, that the decision to collect seeds means curtailing to some extent the flowering season of annuals. This is explained by the fact that if all faded flowers and seeds are removed as they appear, a plant continues longer in bloom than if it is allowed to run to seed.

Troublesome as seed acclimatization may be, its use has many advantages both from an economic point of view and in the results attained. Beyond a small expenditure on labour, it costs nothing. The

seed can be sown for the winter garden a good six weeks earlier than imported seed ; and the plants are well-advanced, and, in many cases, in bloom before cold frosty nights set in and reduce growth to a minimum.

Armed with good quantities of acclimatized seed, the amateur is in a position to take chances with the weather, secure in the knowledge that, should the first sowing fail, there are ample supplies at his disposal to carry on with ; whereas, with imported seed in very small quantities and highly expensive, such risks cannot be incurred and his efforts are limited to sowing at a late safe date, which results in a late flowering period, particularly if the winter cold proves unduly severe.

Having regard to all the circumstances, the following broad rules are suggested for the guidance of amateurs :—

- (1) Vegetable seeds generally should not be collected. For one thing the collection of vegetable seeds is much more troublesome than in the case of flowers. Again, the quantity of seed required is so small and the deterioration of acclimatized seed is so marked that it pays to buy the best seeds.

If desired, however, seed of early cauliflower, peas, onions, beetroot and maize may be collected for use in large gardens.

- (2) Seeds of flowering annuals required for exhibition and pot work should always be purchased from the best seed stores. This includes a number of varieties that do not seed, such as double petunias, pansies (as distinct from violas) and double flowering stocks.

The following are varieties of annuals of which it is preferable to buy fresh seed for exhibition purposes :

<i>Ageratum</i>	<i>Nasturtium</i> (double flowering varieties)
<i>Aster</i>	<i>Nemesia</i>
<i>Carnation</i> (annual flowering)	<i>Pansy</i> (as distinct from <i>viola</i>)
<i>Celosia plumosa</i>	<i>Petunia</i> (double flowering)
<i>Cineraria</i> (varieties)	<i>Petunia</i> (Exhibition single flowering)
<i>Clarkia</i>	<i>Salpiglossis</i>
<i>Dahlia</i> (hybrids)	<i>Schizanthus</i>
<i>Dianthus</i> (fringed)	<i>Stock</i>
<i>Godetia</i> (varieties)	<i>Venidium fastuosum</i>
<i>Heliotrope</i>	<i>Zinnias</i>
<i>Linaria</i>	

- (3) Seeds of the following varieties of flowering annuals may be safely collected for use in the flowering borders and for cut work :—

<i>Acroclinium</i>	<i>Larkspur</i> (separate colours)
<i>Alyssum</i>	<i>Lavla</i>
<i>Antirrhinum</i>	<i>Linum</i>
<i>Arctotis</i> (Grandis and Hybrids)	<i>Linaria</i>
<i>Balsam</i> (separate colours)	<i>Lupins</i> (separate varieties)
<i>Brachycome</i> (separate colours)	<i>Marigold</i>
<i>Candytuft</i> (white)	<i>Myosotis</i>
<i>Calendula</i> (separate varieties)	<i>Nasturtium</i> (single flowering)
<i>Coreopsis</i> (separate varieties)	<i>Nicotiana</i>
<i>Cornflower</i>	<i>Nycterira</i>
<i>Cosmos</i>	<i>Petunia</i> (separate colours of bedding varieties)
<i>Cynoglossum</i>	<i>Phlox</i> (separate colours)
<i>Chrysanthemum</i> (annual flowering)	<i>Portulaca</i>
<i>Dianthus</i> (separate colours)	<i>Salvia</i> (scarlet and blue)
<i>Dimorphotheca</i>	<i>Saponaria vaccaria</i>
<i>Eschscholtzia</i> (separate colours)	<i>Shirley Poppy</i>
<i>Gaillardia</i>	<i>Statice</i>
<i>Gerbera jamesonii</i>	<i>Sunflower</i>
<i>Gypsophila</i>	<i>Sweet Sultan</i>
<i>Helichrysum</i>	<i>Ursinia</i> (varieties)
<i>Hollyhock</i>	<i>Venidium calendulaceum</i>
	<i>Verbena</i> (separate colours)
	<i>Viola</i> (not pansy)

Seeds of many of the flowering annuals listed above may be carried on for several years without any marked deterioration in colour and size of bloom. It will, however, be found that colours tend to fade,

particularly among the shades of red and blue ; the plants acquire a taller habit of growth and in some cases the blooms may suffer a slight reduction in size and form.

To leave seed collection entirely in the hands of the *mali* is to court disaster, as it invariably ends in a horrible mixture of varieties and colours of which the owner is not aware till too late to remedy matters without sacrificing his early show of bloom and thereby losing the main advantage gained by seed acclimatisation.

It is necessary to take notes on the characteristics of the varieties it is considered worth carrying on to the next year, not only in one's own garden but also in those of other keen growers, as considerable trouble and expense may be saved by the mutual exchange of seed. The knowledge thus gained is more reliable than can be obtained from the perusal of seed catalogues because of the varying effect of climatic conditions on growth and bloom.

Having noted the species and varieties to be collected, the next step is to ascertain if they are all fixed strains and can be relied on to come true to form and colour the following year. In most cases, if the seeds were procured from firms of repute, the varieties may be depended on. Before serious collecting is commenced the plants should be carefully examined and the less perfect in growth, bloom and colour eradicated. This is only possible for those with a good knowledge of the species and varieties at their disposal and those not well-informed will do well to seek help and advice from gardeners who are.

During collection, deal with as few varieties as possible at a time in order to lessen risk of confusion. See the seed has reached the right stage of maturity and dry slowly in a shady, airy situation in a porous vessel or between sheets of paper, each with its own descriptive label. If the seedheads are collected with a small portion of the stem attached, the nutriment

contained therein will help to perfect those which are slightly immature, and the ultimate percentage of good seed will be higher than if only the seed capsule is plucked. On no account should drying be done in direct sun or the vitality of the seed will be seriously impaired.

When thoroughly dry and all rubbish removed, store in air-tight tins or glass vessels hermetically sealed with wax or candle grease and keep in the coolest place available. Before sealing, add a small quantity of Keating's powder to each tin in case the ova of seed weevils is present. This is particularly necessary for the larger albuminous kinds such as the seeds of composites, legumes and others. In the case of the less familiar kinds of flowers it is advisable to add a few particulars to the name label such as colour, height, spread and period of flowering.

(6) TREATMENT OF CUT FLOWERS

The arrangement of flowers for decoration purposes is naturally a question of personal taste. The following notes merely cover the treatment of cut flowers.

To get the fullest possible value from your cut flowers, there are several methods of treating them that will considerably lengthen their life.

Flowers should, as far as practicable, be cut in the morning, before the sun gets to them.

Many flowers of the daisy variety, such as aster, will keep fresh twice as long as usual if they are kept in water in which sugar has been dissolved. Use a teaspoonful of sugar to each quart of water. This treatment also prolongs the freshness of tulips.

Some popular flowers like poppies have hollow stems which "bleed" when cut; and, if they are not properly treated, they have a very short life. Immediately they are picked the ends of the stalks should be sealed either by standing the bottom inch or two of the stems in boiling water for a minute; or by scorching the cut ends in a flame. Another hint that

ensures poppies and similar flowers, that drop their petals rather quickly, lasting very well is to put a drop or two of thin clear gum right in the heart of each bloom. As an alternative to gum, a little gelatine can be melted and dropped into each flower. This sets and holds the petals, so that flowers treated in this way keep much longer than usual.

Always crush or split open for a few inches the ends of the stalks of hard-stemmed flowers, which include roses, branches of flowering shrubs and chrysanthemums. Then keep them in vases of water in which either alum or ordinary salt has been added at the rate of two teaspoonfuls to a quart of water.

Remove all leaves from the lower part of the stalk. The water will keep cleaner and the flowers will not drink so much.

Roses also should have thorns removed and the lower part of the stem peeled for an inch or so, and split.

Too many flowers in one vase should be avoided. When possible, use wide-necked vases for they are more conducive to fresh flowers than a small-necked vessel, which may exclude the air.

Cut flowers of varieties of plants which close in the evenings will very often develop the habit of staying open throughout the day in a room if they are kept a day or two in vases.

Clean water and vases or bowls are essential for the freshness and long life of flowers; and to help keep the water sweet and clean, the leaves of wall-flowers, stocks and other leafy-stemmed flowers should be stripped off the stalks up to where they go into the water. The water in vases ought to be changed about every other day in order to prevent it from going dirty and sour. Each time the water is changed, clip off a small piece from the ends of the stalks of all flowers except those, like poppies, with hollow stems. A few small lumps of charcoal in a vase will often save frequent changing of water, though more water must be added as the flowers drink it up.

Flowers keep freshest when placed in the coolest part of a room. They do not, however, like cold draughts, which cause most cut flowers to wilt quickly. Flowers which have wilted and gone limp prematurely can often be revived by cutting the ends of the stems and plunging all but the actual blooms in a deep container of cold water. If this is kept in a cool dark place for a few hours it will generally succeed in making the flowers fresh and stiff again.

If one wants to send flowers by post, they should be gathered in the early morning and cut with a sharp knife or scissors. Put them in water for an hour so that they may absorb enough moisture for the journey. For packing, wrap the ends of the stalks in damp cotton wool. The flowers should be packed so that they cannot move about. Fill odd corners with cotton wool. Put a newspaper round the box before adding the final brown paper wrapping. Label "Flowers—With Care."

Flowers which come by post or which have been bought at a florist's should be loosened from their bindings and each stem cut half an inch from the end in a slanting direction, so that a large area of the stem is exposed to the water. Each flower should then be put into cold water right up to the head and left in the cool for some hours. The flowers will then revive and the stems will be straight and stiff.

Flowers can be preserved for months by immersing them in melted wax. Choose any suitable late blooming flowers. Strip the stems carefully of all leaves and at the extreme end of each stalk bind a piece of flower wire. Form it into a sloop and hang up each flower for not less than 20 minutes in a temperature not less than 65 degrees Fahr. to remove any moisture that may be in the petals. Then place some white wax in a small saucepan and heat until it liquefies. Now take the blooms and thoroughly immerse them in the wax and hang up by means of the looped wire in a current of cool air until the wax hardens. Treat the leaves in a similar fashion and

fasten them on to the flower stalks as naturally as possible with fine wire.

The following is a Spanish method of preserving flowers. Take a jar large enough to contain the blooms, place in it a lump of clay and stick the flowers upright in this. Pour in fine dry sand till the flowers are completely embedded in it, working very slowly and carefully lest you disturb the petals. Dried in this manner, blossoms keep their form and much of their colour for many months.

Flowers can easily be dried between sheets of white blotting-paper, in a press but the flowers, while keeping their shapes quite well, are apt to turn brown.

The colours can, however, be preserved. The best way is to dust salicylic acid over the blooms as they lie in the press, and remove it with a brush when they are dry. Red shades in particular are well preserved by this method. Another way of applying the same preservative is to make a solution of one part salicylic acid in 14 of alcohol, soak blotting-paper or cotton-wool in it and place this above and below the flowers. Powdered boracic acid gives almost as good results.

There are several ways of preserving foliage.

The foliage should be thoroughly dried as soon as possible after being gathered and trimmed.

After being pressed, leaves may be dipped in melted beeswax and smoothed with a warm iron. Or they may be varnished, though this method is not so good on account of the time required for drying.

Another way is to spread the leaves in a suitable pan between layers of fine sifted dry sand made as hot as the hand can bear. When the sand has cooled, remove the leaves, press with a warm iron, dip them for a moment in melted paraffin wax and dry in the cool air.

Here is still another way : spread several thicknesses of thin brown paper on the table. Arrange the leaves

of a spray on this, removing those which do not add to its beauty, and spread it out smoothly. Pass a warm iron over a cake of wax, then over the leaves, first on one side, then on the other. Put the sprays between paper, and leave under pressure between two flat boards for several weeks, changing the paper occasionally.

A note on how to make flowers bud before their time will be of interest here.

Some experiments which are reported to have been carried out at a research station, have shown that the opening of flower buds may be hastened to a surprising degree. A rose bush in full bud was selected and a small trench was opened in the soil all round the stem. This was dug out to the depth of four or five inches. Small lumps of quicklime were scattered along the trench and it was then filled in. The whole of the bush was next covered with a cask and the soil at the base saturated with water. The inside of the cask was soon filled with a steamy atmosphere, which had an amazing effect upon the buds. In little more than an hour they had expanded most beautifully.

There is small doubt that the plan would be of commercial value where it is desired to secure flowers at short notice. In any case the experiment is an interesting one to carry out in the garden. To those who do not understand the way in which the plan is carried out the expansion of the flowers seems almost magical.

CHAPTER X—CALENDAR OF GARDENING

THE dates suggested in the calendar for various operations in the garden are the most suitable and are calculated to give the best results.

There is, however, no reason, when circumstances dictate, not to experiment with planting, etc., at other times, particularly in equable climates, in which the growing season is not rigidly restricted to a portion of the year.

Good results may sometimes be obtained out of season but there is always the attendant risk of loss of seeds and plants in such cases.

The notes in the calendar are necessarily brief and it will be necessary to consult the earlier chapters of the book for full directions on the various items of work to be done.

JANUARY

Holes for planting trees, and beds for new shrubberies, hedges and climbers should be prepared.

Old trees and plants which have lapsed into a sickly dormant state may receive the treatment recommended in Chapter II.

Winter flowering annuals in pots and borders will be in full growth and should receive regular treatment in the form of cultivation and dosing with liquid manure. Plants liable to damage by frost should be protected when necessary by covering or moving to sheltered positions.

Similarly, plants in borders subject to damage by frost should be protected as necessary by matting screens.

Sweet Peas should receive regular treatment in the way of cultivation and liquid manure. Tendrils and flower buds should be removed from plants grown for exhibition purposes.

Foliage plants in pots will be in a dormant state. Watering should be restricted to a minimum. Delicate varieties should be protected from the effect of cold north winds and frost.

The vegetable garden will need constant attention in the way of cultivation, irrigation and treatment with liquid manure.

The last sowings of seeds of lettuce, carrot, beet, turnips and radish may be made during the first fortnight.

Nursery seed beds should be cleared of weed, seedlings, etc., and got ready for the sowing of

summer flowering annual seeds and planting of cuttings of shrubs and hedge plants.

The orders for seeds of summer flowering annuals should be placed.

Roses will be in full flower. Dead flowers should be regularly removed and the soil cultivated.

Chrysanthemums in pots may be sorted out and a sufficient number selected for the next year. Surplus plants may be given to neighbours or added to the manure heaps. Treat selected pots with liquid manure to secure strong shoots.

FEBRUARY

This is the best month for the winter garden and flowering annuals and shrubs should be in full bloom by the end of this month.

Planting of new trees, shrubs, climbers and hedges should, if possible, be completed now.

Cuttings of *Duranta*, *Cleorodendron* and *Acalypha* for hedges may be planted.

Sweet Peas and annual flowering borders should receive constant attention. Dead flowers should be removed regularly and the soil should be well cultivated.

Exhibition Sweet Peas should receive special attention. The first flowers may be allowed to bloom two or three weeks before the date fixed for the Show.

Flowering annuals in pots will now be coming into bloom and should receive every care. Frequent doses of liquid manure and regular cultivation will help to improve the quality of the flowers and strengthen the plants.

Alternatively, root filled and well established pot plants may be given a top dressing of comparatively fresh horse manure.

Delicate varieties of annual flowering plants and foliage plants in pots should be protected from frost.

The winter vegetables will now be producing well. Regular spraying with clean water and cultivation will be beneficial.

A start may be made with the preparation of the ground for summer vegetables.

The nursery and seed beds should be finally prepared for spring sowing and propagation.

Chrysanthemums may be divided and potted in 3" pots in sufficient numbers for the next winter's needs. It is wise to pot up about double the number finally required.

When established the pots should be kept in a sunny position and free of overhanging branches of trees, weeds, etc.

MARCH

The preparation of the ground for sowing new lawns should if possible be completed in order to admit of sowing or planting turf before or during the rains.

Beds should be prepared for Chrysanthemums in the cut flower plot.

The planting of new trees, climbers, shrubberies and hedges not done in February should be completed. Now is the time for sowing seed for new hedges.

Temporary hedges of *Sesbania ægyptiaca* (Jaint) may be sown now and will produce a good winter effect.

This month is best suited for the propagation of cuttings of *Citharexylon subserratum* (fiddlewood), *Caryopteria wallichiana*, *Hamelia patens*, *Phyllanthus angustifolia*, *Buddlea madagascarensis*, *Buddlea asiatica*, *Acalyphas*, *Duranta*, *Hibiscus*, *Holmskioldia sanguinea*, *Bougainvillea*, *Petrea*, *Thysanoloëana agrostis*, *Arundo donax versicolor*, *Daedalacanthus*, *Eranthemums* and *Dombeya mastersii*.

Seeds may also be sown of *Lantana*, *Schinus terbinthifolius*, *Tecoma stans*, *Hamelia patens*, *Poincinnia pulcherimma*, *Murraya exotica*, *Cassias*, *Plumbago capensis* and *Barleria*.

Flowering annuals should now be selected for seed collection. The varieties should be carefully

examined and labelled. The less perfect in bloom and colour should be eradicated.

Seeds of summer flowering annuals may be sown in seed beds early this month.

APRIL

New lawns may now be started by sowing lawn grass seed or planting grass roots.

Renewal of old lawns which have been allowed to deteriorate beyond ordinary repairs should be put in hand.

Cuttings and seeds of shrubs not sown in March should be sown early this month if good results are desired.

Temporary shrubs may be planted in newly made shrubberies to fill up spaces caused by slow growth of permanent shrubs.

Established shrubberies will require careful attention. All shrubs and annuals planted for temporary effect the previous year should be removed and the more robust permanent shrubs judiciously pruned. Dwarf varieties, if weak and scanty, should be replanted.

After pruning, if needed, spread a liberal quantity of manure in shrubberies and fork in to a depth of 6 inches.

Seeds of *Sophora tomentosa* and cuttings of *Reinwardtia monogyna* may be sown.

Cannas will be at their best and should now be selected for propagation purposes.

Seeds should now be collected from the winter flowering annuals and treated in strict accordance with the instructions in Chapter IX.

Foliage plants in pots will have resumed activity. They should be moved from positions exposed to direct sun.

Repotting and propagation whether by seed, division or cuttings may now be proceeded with.

Chrysanthemums may be transplanted from 3-inch to 6-inch pots and to beds in the cut flower garden. Those in pots should continue to be kept in a sunny position free from overhanging tree branches and shade. Chrysanthemums cultivated in the shade suffer considerably when transplanting to final pots and flower unsatisfactorily.

The orders for seeds of monsoon flowering annuals may be placed.

The annual borders and beds intended to be used for summer flowering annuals should be cleared and prepared for the purpose. Seedlings should be in position by the end of the month.

MAY

Young hedge plants raised from seed sown in late March will need frequent attention with garden shears *and should be clipped to 4" till side shoots develop* strongly. The plants should be watered deeply once a week and all casualties made good.

If not previously done, it is advisable to complete the construction of new lawns during this month so as to allow ample time before growth ceases with the commencement of the cold weather.

A surface mulching of coarse leaf mould to trees and shrubberies will reduce the quantity of water required and maintain a more equable supply of moisture at the roots. Young trees should be copiously watered, a deep watering once a week being preferable to a light sprinkling every day. Besides watering, the surface soil should be regularly cultivated and turned.

Climbers and hedges should be examined for red spider. At the first sign of its appearance, syringe heavily with clean water twice a day.

The vegetable garden, Sweet Pea beds, annual borders, etc., should be cleared of all decaying plants, weeds, etc., and well cultivated, even if they are not to be used for summer planting. Irrigation should cease.

Watering of rose beds should be restricted as much as possible.

Seeds of monsoon flowering annuals may be sown in seed beds.

JUNE

During the hot dry days of summer, trees, shrubberies and hedges require a great quantity of water. Water regularly and deeply and spray occasionally.

Clerodendron side shoots that were detached in March are now ready for planting in their permanent positions.

Cannas should be taken out of their places in the garden and laid in shallow trenches. Canna beds should be remade for replanting in July.

Purchase a stock of unslaked lime and store it in an open shed, watering and turning once a week till required for use on lawns.

Seeds of *Callistemon lanceolatum* and *Cassia didymobrya* may be sown this month.

Keep a watch for the appearance of red spider in climbers and hedges.

The vegetable garden, Sweet Pea beds, annual borders, etc., not in use, should be periodically cultivated and cleared of weeds.

"Spinach" and "lucerne" may be sown in the vegetable garden if required [for use as green manure.

Foliage plants in pots should be protected from the direct rays of sun and hot summer winds.

The orders for seeds for winter flowering annuals should be placed now, particularly abroad.

Restrict the watering of roses to a minimum to encourage the wood to harden.

JULY

While the rains last the knives of the lawn mower should be raised in order to keep plenty of foliage on

the grass to enable it to contend with excessive moisture.

Reduce irrigation of lawns to a minimum.

If necessity exists give an application of lime to lawns.

Lawns exhausted and unduly troubled with weeds may receive special treatment (cultivation and dressing of stable manure).

The vegetable garden, flower borders, etc., not in use should continue to be cultivated and kept clear of weeds.

Beds and borders should be planted with monsoon flowering annuals.

Excessive growth of climbers must be thinned out and all dead wood removed.

Avoid over-watering foliage plants and chrysanthemums in pots. If necessary protect the latter from excessive and continuous rainfall.

Seeds of *Cassias* and cuttings of *Acalypha* may be sown at the commencement of the rains.

During the monsoon, irrigation of shrubberies and roses should be suspended as necessary.

Excessive growth of vigorous shrubs should be restricted by careful pruning.

Cannas should be replanted.

AUGUST

This is a busy month on getting ready for winter gardening. Extra manual labour should be engaged.

Lawns continue to be treated as in July.

There is just time left to give special treatment (cultivation and dressing of stable manure) to lawns exhausted and unduly troubled with weeds.

Cuttings and suckers of *Arundo donax versicolor*, *Thysanalaena agrostis* and *Arundinella brasiliensis* may be planted at the end of the month.

Acalypha hedges which were planted in June will need clipping.

The treatment of old trees and plants which have lapsed into a sickly dormant state if not carried out in the winter, may be undertaken now:

While the monsoon lasts, irrigation of lawns, shrubberies, roses, pot plants, etc., should be restricted to a minimum.

Excessive growth of vigorous growing plants in shrubberies should be restricted by careful pruning to allow scope for development of weaker varieties.

Climbers and creepers may be overhauled and treated in accordance with the directions in Chapter VII. *Bougainvillea* may be pruned very severely.

If necessary, rose plants may now be transplanted to new quarters.

Sweet Pea beds and the vegetable garden should be prepared for winter sowing early this month.

Continue to restrict watering of foliage plants in pots.

Acclimatised seeds of cauliflower and cabbage may be sown for early crops. The first sowings of tomato and celery seed may also be made.

Sowings should be made of seeds of Hollyhock, *Nicotiana* and *Salvia splendens*. Sowings may also be made of hardy winter flowering annuals and annuals required for cut work.

Flower beds and borders not in use should continue to be cultivated and kept clear of weeds.

Chrysanthemums may be transferred to their final pots towards the end of the month.

SEPTEMBER

If it has not been possible to start new lawns during the monsoon or hot weather, the ground selected for lawns may now be prepared and planted with *Trigonella* seed for temporary winter effect.

Drop the lawn mower knives and keep lawns mown as close as possible.

An application of ammonia sulphate or nitrate of soda at the close of the monsoon (after the rains cease) will afford immense benefit to lawns.

Strong growing tall annuals may be planted in newly planted shrubberies to fill up spaces caused by slow growth of permanent shrubs.

Climbers should be finally overhauled, unwanted growth being trimmed out and the plants tied in position. Water copiously and if the plants seem exhausted fork in manure.

All water should be withheld from roses to prepare them for pruning. If not previously done rose plants may be transplanted to new quarters.

Further sowings may be made of tomato seeds and acclimatised cabbage and cauliflower seeds. Towards the end of the month, first sowings may also be made of other winter vegetable seeds.

Foliage plants in pots may be moved into position for decorative use, provided they are protected from the hot mid-day and afternoon sun.

This is a good month for "liming" the garden generally, if need exists.

A careful watch should be kept on chrysanthemums in pots. The treatment they receive now will determine the quality of bloom two months hence.

Any carnations in pots carried forward from the previous years may now be pruned and transplanted into new soil.

Violets may be divided and repotted towards the close of the month.

Carnations, Cinerarias, Salvias, Petunias and other annuals required for exhibition or decorative work, which take long to develop, may now be started in pots.

Final sowings in seed beds of acclimatised seeds of winter flowering annuals required for beds and borders should be made this month.

Monsoon and summer flowering annuals may be moved as soon as they cease to flower in order to allow time to prepare the beds and borders for winter use.

Beds and borders required for winter flowering annuals should be finally prepared.

Sweet Peas required for Christmas use may be started now but these should be grown in the cut flower garden as they will be exhausted by February when the rest of the garden is at its best.

OCTOBER

This is a busy month in the garden and it is advisable to engage extra staff.

A second dressing of lime a fortnight after the application of ammonia sulphate or nitrate of soda will benefit lawns.

Established rose plants should be pruned and given a top dressing of manure or bone meal followed by light cultivation.

The planting of new rose plants should be done towards the end of the month.

Seeds of winter flowering annuals not previously sown should be sown this month. Sweet Pea seeds must also be sown by the roth of the month.

Succession sowings at intervals of 10 days or a fortnight should be made of seeds of all winter vegetables.

All flowering annuals required for exhibition or decorative work in pots must be potted up early this month to allow the plants ample time for development:

The planting of annual flower beds and borders must also be completed this month so that the seedlings may be well established before the cold sets in.

Sowings of seeds of Larkspur, Linaria, and Linum may be made *in situ* in beds and borders.

Chrysanthemums in pots will need careful treatment. Continual disbudding will be necessary and occasional treatment with liquid manure.

All *Acalypha* and *Eranthemum* plants should be pinched early this month in order to encourage new leaf before the cold nights set in. Frost and cold adversely affect old leaves much more than newly formed leaves.

Surplus seedlings may be given away to friends before they are spoilt.

NOVEMBER

The lawns will now begin to show the effects of the cold nights and will "brown." Reduce watering as the grass will be practically dormant.

As the cold sets in vigorous growths of climbers will appear and should be cut back as necessary.

Acalypha plants and hedges will slacken growth during the cold weather but here and there vigorous shoots will outgrow the rest and must be clipped back to normal.

Cannas will again be at their best for selection purposes. Old stems that have flowered should be cut back to ground level.

Chrysanthemums in pots will now be in full bloom and pots grown for decorative effect should be arranged in ornamental groups in suitable vantage positions around the house. Those required for exhibition should receive constant care till the day of the Show.

Annual beds and borders should be regularly cultivated and all casualties replaced as they occur.

Successive sowings of vegetable seeds may be made throughout this month. The vegetable garden should be constantly cultivated and irrigated only as necessity dictates.

DECEMBER

There is little work to be done in the garden this month. Roses will be at their best and ready for

exhibition. Cut roses make welcome Christmas day gifts !

Cannas will be going off and should be given a good dressing of rich manure and well watered towards the end of the month.

Final successive sowings of vegetable seeds may be made.

Chrysanthemums will be going off and should be labelled for identification purposes before the blooms fade.

Decide now on colours and varieties for ornamental group work for next winter.

If there is a risk of frost, plants in pots, beds and borders should be protected at night with matting or *sirkis*. This protection should continue till there is no further risk.

Flower beds and borders should be frequently cultivated and irrigated only as necessity dictates.
